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ABSTRACT

The contributors to this document compare the main approaches to agricultural extension in sub-Saharan Africa; the cost-effectiveness in view of precarious national budgets; the weaknesses of the system for generating technology; the difficulties in forging productive partnerships between researchers, extensionists and farmers; the ineffective public services and fragile institutional networks; and the degree to which farmers are allowed to participate in extension management. The articles include: (1) "Agricultural Extension and Its Linkage with Agricultural Research" (D. Pickering); (2) "The Commodity-Driven Approach of the Cotton Companies" (G. Mahdavi); (3) "The Extension System of British-American Tobacco (Kenya) Limited" (F. N. Kimani); (4) "The World Bank and the Training and Visit System in East Africa" (N. Roberts); (5) "A Few Questions on the Training and Visit Method" (D. Gentil); (6) "The Design of T&V Extension Programs for Small Farmers in Ethiopia" (A. Dejene); (7) "Proposals for a New Approach to Extension Services in Africa" (G. Belloncle); (8) "Village Associations and Agricultural Extension in the Republic of Mali" (B. Sada Sy; M. Yero Bah); (9) "On-Farm Research with a Farming Systems Perspective" (M. Collison); (10) "The Farming Systems Approach and Links between Research and Extension" (N. Okigbo); (11) "The Farming Systems Approach in Senegal" (J. Faye); (12) "Extension under East African Field Conditions" (J. R. Morris); (13) "Public Investment in Africa's Extension Services" (J. Howell); and (14) "New Developments in Agricultural Extension" (M. Baxter). A reference list of 95 items is appended. (NL)

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Agricultural Extension in Africa

A World Bank Symposium

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edited by
Nigel Roberts

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Preface

In recent years the World Bank has become closely identified with the training and visit (T&V) system of agricultural extension, which now enjoys a dominant position among the extension methodologies in much of the developing world. Less well known, perhaps, is the fact that the World Bank gives significant support to other extension approaches and values vigorous debate on the relative merits of different systems. This volume and the workshops that gave rise to it are a testament to the Bank's interest in fostering such a debate.

The fourteen contributions that appear here all focus on agricultural extension in Sub-Saharan Africa. They had their genesis in two workshops in Africa, the first held in June 1984 at Eldoret, Kenya (African Workshop on Extension and Research), and the second in February 1985 at Yamoussoukro, Côte d'Ivoire (Agricultural Extension and Its Link with Research in Rural Development). Some of the chapters were originally presented at the workshops as papers and have subsequently been modified, whereas others were written later by workshop participants.

The workshops were organized by the World Bank, with the cooperation of the government in each host country. Funding for the Eldoret workshop was provided by the World Bank, the United Nations Development Program (UNDP), the Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT), the U.S. Agency for International Development (USAID), and the British government's Overseas Development Administration (ODA); for the Yamoussoukro seminar, by the World Bank, USAID, and the French government's Fonds d'Aide et de Coopération (FAC) and Caisse Centrale de Coopération Economique (CCCE).

The proceedings of the Yamoussoukro workshop have been compiled by Guy Belloncle and published in French as *Recherche, vulgarisation et développement rural en Afrique noire* by Focal Coop, Ministre de la Coopération in Paris.

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Abbreviations

AAEO	Awraja (district) extension officer
AEO	Agricultural extension officer
ARDU	Arssi Regional Development Unit
BAT	British-American Tobacco Limited
CADU	Chilalo Agricultural Development Unit
CFDT	Compagnie Française pour le Développement des Textiles (French Company for the Development of Textiles)
CGIAR	Consultative Group on International Agricultural Research
CIAT	Centro Internacional de Agricultura Tropical (International Center for Tropical Agriculture)
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo (International Maize and Wheat Improvement Center)
CMDT	Compagnie Malienne de Développement des Textiles (Malian Textile Development Company)
FSP	Farming systems perspective
FSR	Farming systems research
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (German Agency for Technical Cooperation)
IAR	Institute of Agricultural Research
IDRC	International Development Research Center (also CRDI, Centre de Recherches pour le Développement International)
IITA	International Institute for Tropical Agriculture
IRAM	Institut de Recherches et d'Applications des Méthodes de Développement (Institute for Research and Implementation of Development Methods)
IRRI	International Rice Research Institute
ISRA	Institut Sénégalais de la Recherche Agricole (Senegalese Institute for Agricultural Research)
ODA	Overseas Development Administration
OFAR	On-Farm Adaptive Research
OFR	On-farm research
RDA	Rural development agent
SMS	Subject matter specialist
TAC	Technical Advisory Committee, Food and Agriculture Organization
T&V	Training and visit system of agricultural extension
USAID	U.S. Agency for International Development

Introduction

Nigel Roberts and François Falloux

A basic objective of this volume is to compare the main approaches to agricultural extension used in Sub-Saharan Africa today. Thus Pickering (chapter 1) offers a typology of the extension methodologies most commonly found in the African context. The chapters that follow analyze the strengths and weaknesses of four major approaches or illustrate them in practice with specific case studies: first the commodity-driven approach (Mahdavi, Kimani), next the T&V system (Roberts, Gentil, Dejene), then farmer-participatory extension methodologies (Belloncle, Sy and Bah), and finally the farming systems perspective on extension (Collinson, Okigbo, Faye). The volume concludes with overview pieces on field conditions, financing, and new directions in African extension (Moris, Howell, Baxter).

Despite the diversity of approaches described and perspectives employed, there is a high degree of concurrence when authors come to identify the types of problems that any African extension system must seek to overcome. Considerable attention is given to reviewing the question of cost-effectiveness in view of the precariousness of the budgetary situation in many countries (Mahdavi, Roberts, Howell, Baxter). A second area of universal concern is the weakness of the continent's systems for generating technology and the difficulties inherent in forging more productive partnerships between researchers, extensionists, and farmers for the purposes of problem identification and technology testing (Roberts, Gentil, Belloncle, Collinson, Okigbo, Faye, Moris, Baxter). A third set of basic misgivings relates to the ineffectiveness of many countries' public services and to the fragile institutional and infrastructural networks found in most of Sub-Saharan Africa—misgivings which translate into concern about the pitfalls awaiting overoptimistic extension planners (Mahdavi, Gentil, Belloncle, Moris, Howell). A fourth issue commonly identified is the inadequate degree to which farmers themselves are allowed to participate in extension management and the tendency of government extension services to respond more to bureaucratic imperatives than to the demands of the farming populations (Belloncle, Collinson, Okigbo, Faye, Moris).

Although there is a fair degree of consensus on what the important problems are, it will be apparent to the reader that the contributors to this volume do not readily agree on a set of solutions to them. On many topics, perspectives and opinions differ markedly. For example, authors such as Howell and Moris see in T&V a potentially valuable approach to extension management, provided that the classic Indian model is sensitively adapted. For Belloncle, however, and to some extent for Gentil, the T&V system is based on a set of assumptions about rural society and the role of interventionist bureaucracies that are patronizing and erroneous—and that therefore undermine the T&V system's rationale. Howell and Baxter strongly question both the validity and the practicality of recovering from farmers the costs associated with extension when it is oriented toward food crops. Mahdavi and Roberts, however, regard cost recovery of this type as a way of introducing true consumer evaluation into the extension process and thereby providing an objective basis for determining whether extension services should expand or contract and what they should strive to provide.

In other respects, however, the authors evidence important areas of agreement. What is more, we would argue that the exchanges of experiences and views at the Eldoret and Yamoussoukro workshops have been

strongly instrumental in fashioning common assumptions. One such area of agreement is the reaffirmation of both the need for pragmatism in the design of extension systems and the dangers of rigidity, particularly in the multifaceted African milieu. Giving expression to this idea, several authors call for blending the strengths of different systems, specifically the top-down, managerially oriented approaches exemplified by T&V and the bottom-up, locale-sensitive methodologies such as farming systems research (FSR) or *recherche-développement* (Roberts, Collinson, Moris, Baxter). Another issue on which there is no dissent is the budgetary unsustainability of most public or parastatal extension structures in Africa when funding agencies withdraw their assistance, and therefore the importance of devising less costly systems (Mahdavi, Moris, Howell). A point reiterated at Eldoret and Yamoussoukro, and one often downplayed by advocates of extension, is the truism that good extension by itself is only of limited value; unless farmers have adequate financial incentives and timely access to inputs and credit, they will not usually adopt new technologies on any significant scale (Pickering, Mahdavi, Roberts, Okigbo). All of these realizations, simple as they may be, are now part of the common lore of African extension and should shape the design of extension in years to come.

1

Agricultural Extension and Its Linkage with Agricultural Research

Donald Pickering

The need to increase the productivity of Sub-Saharan African agriculture is urgent and clearly comprehended. Basic food production in many countries cannot keep pace with the rapid growth of population; agricultural exports have declined in most instances; the area has suffered, and is still suffering, from widespread adverse weather conditions; and reserves of potentially productive agricultural land have been severely depleted in many countries.

Sub-Saharan Africa depends unequivocally on agriculture for economic growth and the well-being of its people. If sustained growth is to be achieved, and if its people are to enjoy higher living standards, agriculture *must* become more productive. But this is more easily said than done.

It is not necessary to catalog here all the factors that govern agricultural productivity. It is enough to remember, and to keep bringing to the attention of policymakers and politicians, that achieving an increase in agricultural productivity is a complex business; to obtain maximum results a range of factors, many of them interdependent, must be in place and in harmony.

Two of these factors are agricultural extension and research—the means for developing and conveying to farmers the information needed to increase their own productivity and the productivity of their land. To perform their duties, researchers and extensionists need to know who the farmers are—whether they include women and children as well as men, and how the work is divided among them; what they are doing and why they are doing it on their farms; and how the recommended new technologies are likely to affect the farmer, the farm, and other important factors such as the supply and suppliers of agricultural inputs and credit, and the market for the farmer's output. The benefits to be obtained from improved extension are thus closely related to the availability of improved technology, inputs, credit, and market infrastructure. Since these complementary factors are in short supply in many parts of Africa, especially in marginal subsistence areas, improvements in extension and research must go hand in hand with efforts to increase their availability. Indeed, in many cases, extension may not warrant the highest priority.

A historically informed review of West African agriculture indicates that over the years many different systems of agricultural research and extension have been preached, and some have been practiced, in the region. These systems were designed with different and sometimes unclear objectives in mind, for different agroecological zones, and for different crop or livestock enterprises; and they were applied in, but not necessarily designed for, varying socioeconomic circumstances. It should be obvious that there is no single blueprint for the "best" research or extension approach, since each research center and extension service must take account of its own context and the conditions under which it operates. There are, however, some basic principles that need to be respected, properly defined, and adequately translated into operational procedures.

Between 1970 and 1980 the World Bank committed more than $745 million in support of twenty-seven full-scale agricultural extension and/or research projects in thirteen countries. In addition, financial assistance amounting to about $370 million was provided during the same period for research and extension components in 312 agricultural and rural development projects in eighty countries. Substantial financial and staff resources have thus been deployed to improve extension services and strengthen agricultural research. Since

1980 the Bank has continued to give strong support and impetus to the search for innovative approaches in extension, to the elimination of chronic organizational weaknesses that have plagued extension services, and to the formation of sound policies for linking agricultural research to extension work and to farmers' needs. In pursuit of this, the Bank has supported various approaches to extension, constantly looking for increased effectiveness—and making numerous concessions to the realities of local conditions and resources. It has been a continuous learning process, based on critical assessments of actual experience, while avoiding blind acceptance of one or another blueprint. With the proviso that such flexibility is essential, it may be helpful to take a look at some of the different systems of, or approaches to, extension practices in Africa in the recent past—to explore their relative strengths and weaknesses, and to derive appropriate lessons for current and future activities.

Extension Approaches

Without attempting to provide any definitive classification or categorization, I have adapted a typology from "Six Approaches to Rural Extension," a paper by Haverkart and Roling (1983) that is used at the International Agricultural Center, Wageningen Agricultural University, in their course on international rural extension. As the approaches were used, they changed over time in one or another respect and are now rarely practiced in a pure form. Some of the approaches partially overlap, and certain elements have been transferred from one to another. For the purpose of further discussion, we can consider the following five broad categories of extension: the commodity-based approach, community development-cum-extension, the approach centered on technical innovation, the farmer-focused approach, and farmers' group-based extension.

One of the most widespread formal extension systems in West Africa is the *commodity-based approach.* In its original form, it follows an organized and coherent set of procedures designed to facilitate the production of a single cash crop and is not usually used for subsistence agriculture. The approach is based on the technical, administrative, and commercial requirements of the predominant crop and is managed usually by a parastatal board or society or sometimes by a private company. Preeminently successful examples include the Compagnie Française pour le Développement des Textiles (CFDT), which provides extension services for cotton growers in a number of francophone West African countries, and British-American Tobacco (BAT) Limited in both East and West Africa. In these and other good schemes, a technically sound and well-researched package of recommendations for the crop in question is systematically conveyed to farmers, extension advice is integrated with a reliable supply of inputs and with marketing arrangements, and the company pays farmers promptly for their production.

There are several disadvantages to this approach. The parastatal or crop-processing and marketing organization often has monopoly power, and extension activities may help the company earn excessive profits at the farmers' expense. If the company is poorly managed and is forced to alter input or output prices to finance its inefficiency, then the comparative advantage of the crop can be affected and poor returns to farmers can result. The emphasis on one crop can sometimes mean that local needs are ignored and that insufficient attention is given to traditional food production. The best examples, however, increasingly take account of the factors affecting secondary crops as well. The cotton parastatals in Côte d'Ivoire, Mali, and Togo have extended their crop coverage and now provide technical advice and credit for the main food crops grown along with cotton in the farming systems concerned.

Community development-cum-extension has operated to a limited extent in Africa and rather more in other parts of the world, especially India. It is constructed around a broad definition of the functions of the extension agent and makes positive attempts to link extension to other aspects of overall community development. In practice, however, this approach has drowned the village agent in a long list of loosely defined tasks that infringe upon his specific responsibilities for agricultural extension and thereby disperse both his attention and his accountability among many different activities. Although often called an extension agent, in reality the individual tends to be either a general community worker or at most a general agricultural officer. His wide variety of technical and administrative duties can include family planning or health services, credit schemes, technology promotion, distribution of supplies, political mobilization, and ad hoc assignments such as census-taking. This set of duties is so broad that the results are usually poor performance, confused supervision, discontinuity, and lack of mobility; little organized work is done, and the agricultural extension function is normally neglected. At a time when specialization and professionalization are clear prerequisites for technical progress in agriculture, such extension cannot significantly increase production and productivity.

The *innovation-centered approach* in extension has the primary function of transferring to farmers technology from outside their socioeconomic context, by actively promoting technical innovations and persuad-

ing farmers to adopt them. Inherent in this approach and undermining its effect is an insufficient appreciation of the farmers' circumstances. Rather than starting from the actual conditions and constraints that farmers face, it attempts to graft ready-made, packaged innovations (such as standardized types of fertilizer and rules for its application) on farming systems that may not necessarily be capable of absorbing them. In Africa another problem with this approach is often the inadequacy of the technical information being extended. This shortcoming usually derives from a failure to carry out the final stages of testing on farmers' fields in different ecological zones and with different types of farmers.

The *farmer-focused approach* is best exemplified by the training and visit system (T&V), which is in essence a method for organizing and managing an extension service. It puts the farmer and his constraints, abilities, and needs at center stage and attempts to mobilize the entire extension apparatus and research system to service him. As do other approaches, T&V disseminates innovations and technical recommendations, but it takes as its starting point the farm and its immediate difficulties and potential, addressing both food and cash crops to the extent that relevant information is available. As a management system, T&V tries to overcome the problems normally encountered by governmental extension services by stressing the need for extension agents to make regular visits, to receive good supervision, and to acquire specialized knowledge. Its intention is to focus extension efforts on well-researched, key impact points and to ensure that contact farmers are representative of different socioeconomic groups among the farm population. Forging and sustaining research-extension linkages is a high priority in T&V—to be accomplished through such exercises as the careful joint definition of impact points and the joint conduct of adaptive trials on farmers' fields. Typically the system has been grafted onto the innovation-centered approach, with the risk that a top-down orientation will be retained. A conscious effort must therefore be made to ensure that T&V does, in fact, focus on farmers' problems, perceptions, and needs rather than on the management of information delivery alone.

Sometimes in the farmer-focused approach to extension a useful operational distinction can be made between variants in which the farmer is approached individually (through selected contact farmers) and others in which the extension service works with farmers' groups, either those already in existence or groups formed for extension purposes. The modalities of agent-farmer communication have significant methodological and sociological implications, and benefits may be gained from comparing their advantages and disadvantages in different cultural contexts. Group formation is a complex social task, and extension agents are often unequipped to do it properly. Roling (cited earlier) emphasizes, on the basis of his field research, that the success of group extension depends on five different sets of activities by extension staff: mobilization, organization, training, technical and resource support, and replication and maintenance. All five elements have to be addressed if the approach is to be successful, since they are closely interdependent. Various extension systems are based on group activity and take into account these principles to a greater or lesser degree.

One particularly interesting example of group extension is the concept of *groupements villageois*, or village associations, which has developed in West Africa. This approach has on occasion been successfully grafted onto the commodity approach, as in the World Bank–financed cotton and food crop project in southern Mali run by the Compagnie Malienne de Développement des Textiles (CMDT).

Cooperatives have also been used as a basis for group extension efforts, but the success of extension in this context is inevitably bound up with the success of the cooperative as a whole—which tends to be almost inversely proportional to the extent of administrative interference in its affairs by the government. Cooperatives need to grow in response to the felt needs of farmers, not as a result of pressure from outside. Sometimes such associations and groups have fallen into the hands of an elite that abuses them for its own political or financial ends. When cooperatives are successful, however, they may even reach the stage of financing their extension agents—as in Cameroon in the World Bank–funded West Highland Rural Development Project. There, a percentage of the agent's salary and benefits is provided by the cooperative, while training and technical support is provided by the government. The more impressive farmers' associations are likely to possess a sense of service to their members and to offer the prospect of relieving the government of part or all of the cost of providing extension staff at the grass roots, and perhaps at higher levels too.

Some Pointers

Every country needs a sound agricultural policy framework in which research and extension goals can be defined within a clear hierarchy of national development priorities and in which appropriate budgetary provisions can be made for the effective use of extension staff. As a rule of thumb based on experience in many countries, it is prudent to use no more than 70 percent of the recurrent funds available to extension for salaries; some 30 percent would then be left for transport

costs, allowances, and other items necessary to ensure staff mobility and operational effectiveness. A number of African countries have found themselves with an extension payroll that has forced them to devote a disproportionate 85 to 95 percent of their recurrent funds to salaries; as a result, the staff have become desk-bound, frustrated, and ineffective. To mitigate this situation, maximum use should be made of private sector initiatives for specific crops that can bear the cost of an extension or research service. In addition, self-reliant farmer organizations should be fostered and encouraged to take over appropriate government support functions at the local level, since these services are often costly to maintain and inefficient at best.

When pondering ways of reducing the costs of extension, one needs to remember what an extension system is supposed to accomplish. All successful systems in developing countries emphasize face-to-face contact and practical field-based training and supervision, which impose certain cost parameters. The ratio of extension workers to farmers should vary according to the density of population, settlement patterns, and the nature of the farm system; the number of staff can be contained, however, by the judicious use of farmers' groups and the radio—where appropriate—or even television. Too often, radio programs that should augment extension are planned quite separately from ongoing field programs. If instead they are made part and parcel of the same program and planned together with it, they will not only have a multiplier effect but also can often reduce the requirement for contact staff in the field.

With regard to technology, the need for close liaison between research and extension cannot be overemphasized. Ensuring that research programs are relevant to farmers' needs requires, among other things, that validation programs are effectively and jointly carried out on farmers' fields with the active participation of farmers. In addition, one needs to institutionalize procedures for joint review by research and extension staff of research, extension, and adaptive trial programs. Organizing periodic workshops for research staff with extension subject matter specialists has proved to be a valuable way of promoting communication and understanding.

Any extension program must be well organized and planned with specific objectives and responsibilities for all staff, particularly subject matter specialists. It will benefit from a single line of command and continuous, task-focused training programs for agents. In considering various approaches and principles, policymakers need to ask what can best be afforded in their respective countries and what features most need to be strengthened. A likely candidate for attention in most instances will be manpower training to upgrade both technical specialists and extension and research managers.

Many policymakers continue to remain woefully ignorant of the role of women in African farming systems. They need to recognize that a very large proportion of the family farm labor force is female and that women are in many cases pivotal to the success of agricultural development. This realization calls for some fundamental rethinking of much of the conventional wisdom on crop and livestock production, the improvement of technology to increase productivity, and the extension systems that promote information flows from farmers to research workers and from research workers back to farmers.

Investing in extension should be regarded by both international and national agencies as a continuous learning process, with plenty of lessons on farmers' behavior and on development dynamics to be harvested. It bears repeating that there is no panacea for agriculture in Africa and no single blueprint for the best extension approach. The problems vary enormously in their nature and severity, and each approach must be tailored to meet particular conditions. Blind adherence to a system that has been successful elsewhere can be a recipe for disaster. One must also understand a country's existing extension system if one is to recommend improvements that can be introduced with a minimum of upheaval and a maximum of positive impact. It is important to take stock of the situation in the light of national constraints, resource potentials, and existing research and extension systems. This stocktaking should give full consideration to the economic, social, and cultural conditions of the people: the men, women, and children who make up the farming population and without whose support and understanding the systems are valueless. Thereafter it should be possible to begin to find ways and means of improving existing systems to make them more effective and efficient.

Paper presented at the seminar on Agricultural Extension and Its Link with Research in Rural Development, Yamoussoukro, Côte d'Ivoire, February 17–23, 1985.

2

The Commodity-Driven Approach of the Cotton Companies

Guy Mahdavi

The Compagnie Française pour le Développement des Textiles (CFDT, French Company for the Development of Textiles) was established in 1949 by the French government, which owns two-thirds of its capital, and was charged with the development of cotton in the French colonies. The CFDT has two features: deliberate vertical integration (from extension services at the producer level to the export of processed goods into the world market) and close links with agricultural research, in this case the Institut de Recherches du Coton et des Textiles Exotiques (IRCT). After the countries in which the CFDT operated achieved independence, the CFDT encouraged the establishment of parastatal companies (the "cotton companies") and continued to supply them with technical assistance in agricultural extension, processing, marketing, management and accounting, and the maintenance of equipment. Today the CFDT has a total staff of 350, of whom 100 are at the Paris headquarters and 250 are in the field; it operates in twenty-nine developing countries, twenty-four in Africa and five in Asia.

For a long time there was a striking similarity between the organizational framework and methods of operation of the CFDT and those of the companies it had helped establish; one even spoke in generic terms of the "CFDT method." Properly speaking, the CFDT method no longer exists. There is, however, an approach to extension which, though differing from one country to another depending on social, historical, and political factors, is defined by a number of features. The extension worker deals with all agricultural activities associated with cotton through group action at the village level. He does not work with pilot farmers or contact farmers, but with a group, even though some demonstrations are done for individuals. In addition to his extension work as such, the extension worker generally organizes the supply of inputs and agricultural credit and is involved in marketing output and the formation of village commercial groups. The extension worker will normally transmit only those recommendations that have been thoroughly tested and that are no longer experimental; these recommendations can usually be applied in full by interested farmers because the equipment and inputs necessary to implement them will also be made available through the same extension system. An emerging trend is for the extension workers to transfer their responsibilities more and more to farmers' associations. The group approach facilitates this transfer and encourages the creation of such groups.

These features are found in most CFDT-derived extension services, despite some differences in approach and organization. This integrated approach to extension, provision of services, and marketing activities has been highly instrumental in boosting cotton production to 850,000 tons a year in West Africa, with an average yield of 1,000 kilograms per hectare. Furthermore, in these cotton-growing areas, surpluses of food crops have developed because the producers have made efficient use of available resources by employing appropriate modern production systems and techniques.

This chapter focuses on the evolution of intensive cultivation in the cotton areas of West Africa and on the development of the extension systems and farmers' associations that have fostered this evolution.

Intensive Cultivation

For many centuries, throughout the world, agriculture made little dynamic progress. Established farming

techniques were repeated by successive generations without major changes; at best, soil fertility was maintained. The productivity of human labor was modified only with the use of draft animals and with farming tools which remained similar for long periods. Farmers' techniques and resources remained relatively unchanged from the early periods of recorded history until the nineteenth century, when some countries started to use fertilizer and agricultural machines. Plant material and farming techniques were adapted to these new productive conditions, and intensive cultivation began.

African farmers, however, did not take part in this evolution. Many continued, as nomads or seminomads, to practice a system of cultivation that let fields lie fallow for long periods of time. These techniques resulted in low productivity, but were generally adequate to ensure survival and were appropriate to the prevailing requirements of society. If the productivity of labor and land were to be increased, however, this balanced but limited traditional system had to be replaced with something which would allow the introduction of improved techniques for managing time and resources. In cotton-producing regions, this change took place in two phases.

First Phase

Cotton was a new crop for most of the countries in which the CFDT worked, though not entirely new to West Africa (it had been grown in Ghana since the 1890s, for example). At the outset the challenge was to persuade farmers that cotton growing could, under their own management, be financially attractive—and this often in regions where the introduction of cotton marked the first time that the farmers' world was opened up to cash cropping and to a market economy.

It has taken about one generation (twenty years) for CFDT farmers to assimilate basic improved techniques and to accept the changes thereby introduced into their work methods. For example, row cultivation and single cropping, which are now universally accepted, had to prove their effectiveness to a population used to sowing several types of plant at random in the same fields. This took time, since the habit of interplanting was a rational response to local circumstances. By employing this technique farmers ensured that land was in use over the longest possible time during the season and that harvesting would be spread out and more manageable as a consequence; they spread the risks of adverse weather and pests over several crops; and they took advantage of the fact that certain plants complement one another and control soil erosion when they are grown together. Random sowing had another advantage for the women who were responsible for sowing and weeding. A mother could work around the spot where she had placed her baby, keeping him safely in view, then move him and begin again.

Cotton growing, which was performed in addition to the farmers' traditional activities, increased their work load. In order to grow all their crops successfully, the farmers had to improve the productivity of their labor. The introduction of row seeding facilitated weeding and maintenance and prepared the way for the use of draft animals and mechanization. The new techniques were accepted only when farmers came to realize that they increased productivity. Single cropping on an annual basis, for example, was adopted when farmers saw the advantages of giving different crops different fertilization and spraying treatments—which of course require their spatial separation. The CFDT approach was to induce farmers to intensify each crop separately within the framework of a three- or four-year crop rotation and, by means of organic and mineral fertilization, to eliminate shifting cultivation. Fields could then be cleared with a view to introducing draft animals and mechanization in the near future.

Although these basic techniques improved labor productivity and farm income somewhat, they did not provide any significant leap forward. They also destroyed deeply rooted agricultural traditions which had allowed societies to survive and develop in an environment often hostile and difficult to control. If no other measures were adopted, production would stagnate, and farmers would tend to revert to their traditional techniques if they were not satisfied with the yields obtained by using the new techniques alone. Something else was therefore required—namely, crop intensification.

Second Phase

Crop intensification implies the use of fertilizer, pesticides, and agricultural machines, together with appropriate agricultural techniques, on land where the use of such products can be effective. In the CFDT's experience, farmers have accepted these radically new techniques with surprising ease once they have moved through the first phase—provided that they saw a truly substantial increase in their net income as a result (that is, a return on investment in a particular "package" on the order of 25–100 percent). Conversely, all efforts have failed when the disseminated technology has not been able to produce the incremental incomes required to motivate farmers, and traditional practices have then been taken up again.

At present, the success of cotton growing in West Af-

rica is based on a fairly uniform adoption of all the following recommendations: cultivation by draft animals or mechanization, planting of improved varieties, application of 50 to 100 kilograms of fertilizer per hectare, and the use of effective pesticides and spraying techniques, as well as weed killers and mechanized weeding. Such packages were accepted almost immediately by farmers already acquainted with row seeding, sowing dates, plant population, and weeding and aware of the limitations of those basic techniques.

As a result, entire regions covering tens of thousands of hectares now achieve or exceed yields of 1,500 kilograms of cotton seed per hectare. Modern farming has been developed and promoted, thereby retaining on the land young people attracted by this technology who would otherwise have swelled the ranks of the unemployed in the towns. The rural landscape in parts of Africa is accordingly undergoing change and has become well managed and intensively farmed; the production levels achieved are enabling farmers to sustain techniques, such as mechanization, which are feasible only with a certain level of farm income. The introduction of draft animals, and subsequently of mechanization, has in itself provided the discipline and efficiency required to grow a highly technical crop at internationally competitive standards. Families that were until recently subsistence farmers have now entered the modern world; their objective is no longer merely to survive, but to achieve relative prosperity.

Another change is the development of village associations. In my opinion these groups can become the basis for the organization of rural society in the future, but they will thrive only if there is strong economic support for them. The high-profit cash crop, for which the season's prices and a market are guaranteed, stimulates the development of such structures through the income it brings, the organization it requires, and its impact on the regional economy. Without crop intensification, though, such developments are almost impossible.

The Evolution of Extension Systems for Cotton

Three stages can be identified in the evolution of the extension systems that are commonly associated with cotton growing in West Africa.

The first stage corresponded to the introduction of cotton. The main question was whether farmers could be persuaded to accept additional tasks and different farm management regimes, even though they would stand to gain more income thereby. Ways also had to be found to increase the productivity of their labor in order to permit them to take on this additional work. And given the novelty of cotton cultivation, farmers—as observed above—had to be provided with techniques which would enable them to achieve yields sufficient to give a significant return. Despite the sociological complexities involved in introducing cotton, the techniques were such that it was not necessary for the cotton companies to use highly trained extension personnel at this juncture.

Since the cropping season lasts only six months in most areas, the extension workers were also put in charge of marketing activities to keep them busy throughout the year. At this time, the pyramidal structure of extension services was also developed. At the base of the pyramid, workers with relatively little technical training were charged with conveying, without question, the messages transmitted down the hierarchy. Supervision and training were applied in a top-down manner, with each level supervised and trained by the level immediately above it. The extension system was well disciplined and highly organized.

For years this system provided the necessary services. It permitted the successful introduction of cotton and modernized agricultural techniques. Contact between extension workers and farmers took place at a group or village level: widespread changes and production increases were looked for, and the extension service believed this was best accomplished by dealing with farmers en masse. Some attempts were made to use pilot farmers or leaders, but these failed to achieve appropriate results even though some individuals obtained significant successes.

The second stage was characterized by the integration of the extension function with other activities. First, the supply of inputs, provision of equipment, and management of both seasonal and investment credit were added to the agent's extension and marketing tasks. It should be remembered that in most cotton areas there was no alternative private channel through which farmers could be supplied with inputs. In addition, attempts to launch free-standing agricultural credit had been by and large unsuccessful, since the organizations concerned had no control over the marketing of production and thus lacked the critical power to insist on repayment of credit at the point of sale. By virtue of their produce-purchasing activities, however, the cotton companies were in a good position to administer credit activities effectively. The multifaceted extension worker who dealt with the marketing of production, who granted and collected payments, and who distributed inputs and agricultural equipment thus became an important and respected member of his village in the cotton areas.

A second type of integration occurred with the advent and implementation of integrated rural development projects. These projects became the responsibility of the only strong and viable development structures in their areas—namely, the cotton companies. The extension workers were therefore made responsible for the distribution of food-crop seeds and the dissemination of improved techniques for all farm activities. Many of them, however, were not knowledgeable enough to perform these tasks. It thus became necessary to expand the scope of their training and to create specialists who could provide this training and later support extension workers in disseminating the techniques of food-crop production, animal care, and applied research.

In addition to this training and in order to increase the cost-effectiveness of their agents, the cotton companies promoted the formation of farmers' associations. This innovation constitutes the third and current stage in the development of the CFDT-derived extension system.

The job of an extension worker who deals with an informal farmers' group and that of an adviser to a formal association are very similar. The use of group-level or village-level contacts—as opposed to individual contact farmers—facilitates the evolution of farmers' associations. The cotton companies have always wanted to create a structure compatible with villagers' own interests and have therefore now given local groups the necessary financial means to control and manage all extension activities at the village level. As a result, the extension worker has over time become the village's agricultural adviser, offering technical support for the introduction of new technologies and for the administration of a variety of agricultural activities.

The articles of these associations vary from one country to another. Their functions, size, and the origin of their resources likewise depend on the country and on the objectives for which they have been created. At the end of 1984 there were more than 5,000 such groups with about 130,000 members in the countries practicing extension patterned on the CFDT model. The decision to form a group can be purely voluntary or in some cases subject to a village consensus. All the associations elect their own officers, and the members join in group activities which include cotton and food-crop marketing and, more and more often, the management of input supply and the development of local infrastructure.

In three countries the associations have undertaken complementary development activities, such as running an infirmary and shops, providing contract cultivation services, and conducting literacy classes. The groups receive a percentage of the value of marketed products; most also have access to loans and subsidies, while the profits from their shops or other commercial activities contribute additional resources to the association's funds.

Once such organizations are firmly established, the extension service must rethink its own structure and methods. I believe that the basic extension worker as we now know him will soon disappear. Farmers' associations, if properly supported by the development companies, will then oversee and execute the main tasks of agricultural development. In the next few years the extension worker will become an adviser who attends association meetings and transmits to his senior officers the decisions on crops and on the inputs and equipment needed. When a new technique has to be disseminated, the association's technical committee will be invited to attend a demonstration, or the adviser will perform the demonstration on a member's field. The essential difference will be that the extension worker will no longer have the command over farmers that he once had but will be seen and used more as an employee of the association than of the company. This may sound optimistic, but some groups already work this way; and in view of the successful evolution of intensive cultivation over the last generation or more, it is not impossible to foresee this kind of relationship between extension workers and farmers developing throughout the whole of the cotton area by the year 2000.

Once farmers are able to manage their associations, they can take over true responsibility for their own development. The extension worker can supervise the management of the associations and can continue to administer literacy and postliteracy programs and oversee the supply of equipment and inputs. The interdependency of producers and development companies would thus persist, embodied in a more subtle relationship between association and extension worker-cum-adviser. This arrangement will for a number of years play an important part in providing technical support, organizational ability, and a channel of communication with the company. The strength of a group is greatly enhanced by having the support of a technical organization with a similar economic interest in the production of a crop. For lack of such backup and interest, many village cooperatives in many other settings have met with failure.

Conclusion

I have given a brief description of how an integrated extension system based on the cultivation of a cash crop can change and modernize the rural environment. Can

this approach to extension lead to unbalanced rural development? Will extension workers neglect other crops?

The results obtained in cotton-producing countries seem to indicate the opposite: modern agricultural technology is widely used on the whole farm, and it is rather with traditional or official marketing organizations that farmers face the most difficulties. The existence of a reliable source of cash income enables farmers to have access to seasonal credit for inputs so they can also grow food crops, and this is not possible without a cash crop. The CFDT lesson is that farmers, in time, can engineer their own development through dynamic farmers' associations—but for this to occur, there must be sound economic support of the type that only a cash crop can ensure.

Adapted from papers presented at the African Workshop on Extension and Research, Eldoret, Kenya, June 10–16, 1984, and at the seminar on Agricultural Extension and Its Link with Research in Rural Development, Yamoussoukro, Côte d'Ivoire, February 17–23, 1985.

3

The Extension System of British-American Tobacco (Kenya) Limited

Francis N. Kimani

British-American Tobacco (BAT) Limited introduced tobacco as a crop for small-scale growers in Kenya in the late 1930s in Kitui and Sagana, and in the early 1950s in Embu. These three areas produced only about 10 percent of Kenya's requirements for tobacco, and the balance was imported from Uganda and Tanzania.

In 1974 BAT decided to boost tobacco growing in Kenya in order to make the country self-sufficient in flue- and fire-cured tobaccos. Four areas were identified as suitable for tobacco expansion: Meru in eastern Kenya, Migori and Kuria in Nyanza province, and a belt in Bungoma/Busia in Western province. To ensure that sufficient fuel wood was available for curing the tobacco, as well as for domestic needs, the company started a tree-planting program in 1977.

Before 1974 an average of 100 metric tons of tobacco a year was grown in Kenya for sale to BAT, with yields generally less than 600 kilograms per hectare. Since then, production has expanded so much that the country is now self-sufficient in flue- and fire-cured tobacco. In January 1984 the project had become so successful that for the first time tobacco was added to the country's list of agricultural exports, and 105 tons of locally grown fire-cured leaf were shipped to Europe. In 1982 the company embarked on a new project to produce burley tobacco in the country.

The total production of tobacco in Kenya in 1983 was 6,600 tons, 27 percent higher than the previous year. This was produced by approximately 10,000 smallholders in the five growing areas. Over the years there has been a marked improvement in yields and quality. In 1983 the average yield of flue-cured tobacco was 1,260 kilograms per hectare nationwide, and 1,460 kilograms per hectare in the three main growing areas of western Kenya. Fire-cured tobacco has recorded a similar improvement, with average yields less than 800 kilograms per hectare before 1980 and 1,285 in 1983.

The project is manned by 200 trained extension officers and staff. Through the company's credit scheme, growers are advanced the necessary inputs and services during the growing season. In 1983 approximately 15 million Kenya shillings (roughly US$1 million) were loaned to the growers. Loans are covered by the farmers' sales of tobacco in the same season. Over the years loan recovery has improved tremendously, and today more than 95 percent of the loans are normally recovered. To maintain farmers' incentives, BAT ensures that the farmer is paid promptly on the day of sale. In addition, tobacco prices are reviewed regularly in consultation with the Ministry of Agriculture.

Extension Objectives

The Leaf Department of BAT is responsible for providing extension services to the growers. A relatively young department, it has expanded rapidly since 1974. Its objectives are:

- To plan the production of tobacco and then ensure that the country's domestic and export requirements are met, at a cost acceptable to the company and farmers, and to plan and oversee the forestry targets
- To produce tobacco of a quality acceptable to both domestic consumers and the export trade
- To maximize farmers' profits by helping them to increase yields, while instituting strict controls on the area of tobacco a grower can cultivate
- To improve the overall living standard of the farm-

er by giving extension advice on other farm activities, along with tobacco production

- To guarantee the future viability of the tobacco project by assisting the growers and their communities with tree planting to provide fuel for tobacco curing and domestic use
- To pay farmers promptly for their tobacco output.

The Extension Structure

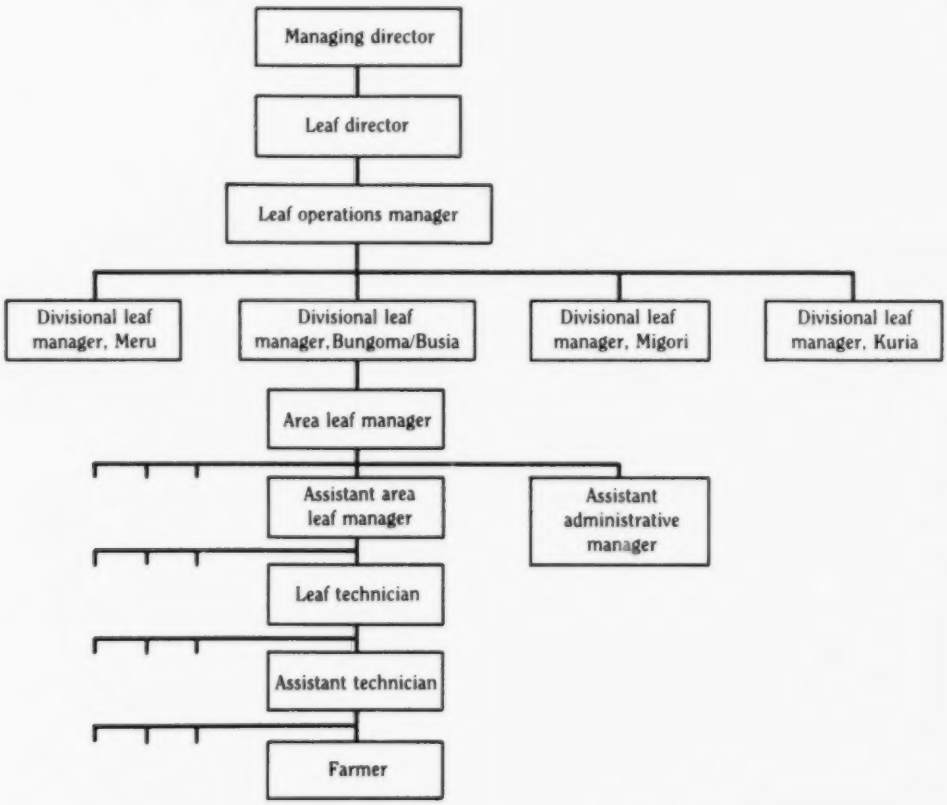
The structure of the Leaf Department extension service is shown in figure 3-1. The duties of staff at the various levels are described in the following paragraphs.

The *leaf director* is responsible to the Board of Directors for all the functions of the department. He communicates to the department's managers the company's policies pertaining to tobacco leaf production and formulates leaf policies of a more general nature. He coordinates the setting of annual crop targets as dictated by domestic and export leaf requirements. He then approves crop and capital budgets for each division and sanctions all increases in staff in line with Board decisions. He discusses all tobacco prices with the government and makes recommendations. He monitors progress in the divisions through his leaf operations manager and visits to the field.

The main responsibility of the *leaf operations manager* is to deal with the technical aspects of the department. He advises all divisions on the preparation of their crop and afforestation plans, approves the plans, and ensures that all the recommended agronomic practices are followed by the divisions. He also liaises with the divisional leaf managers when they prepare their annual crop budgets and their five-year operational and capital budgets, which are discussed with all concerned before being transmitted to the Board by the leaf director for approval. In addition, he monitors the expenditures of all the divisions and takes action to ensure their efficiency, and he prepares with the division managers the five-year requirements for staffing the department.

The *divisional leaf manager* is the key actor in the

Figure 3-1. *Structure of the BAT Extension System*



structure. He is in charge of approximately 2,000 growers and 55 staff and strives to produce an average of 1,200 tons of leaf annually. He manages an annual budget of approximately 32 million Kenya shillings (roughly US$2.2 million) and has usually completed a university degree in agricultural science. His job has five main aspects: planning, implementation, monitoring, administration, and public affairs.

To ensure that his division produces the agreed quantity and quality of tobacco and the required number of trees, the divisional leaf manager prepares an annual action plan that shows in detail how the crop and afforestation targets are to be achieved. He also makes sure that all inputs, materials, and staff needed to implement the plan are received in good time. A crucial planning tool is the five-year development program that details production targets, staff requirements, and leaf and overhead costs. He must continuously monitor the action plan, compare it with the actual field situation, and revise it as additional relevant information becomes available. He manages a system for monitoring all activities and reporting to the leaf operations manager.

Administrative duties include coordinating the preparation of the annual crop budget and the five-year forecast budget for his division, ensuring that the agreed budgets are adhered to, and advising the leaf operations manager whenever changes in the budget are necessary. In addition, the divisional leaf manager prepares a five-year plan for staffing requirements, coordinates recruitment and replacement within the approved establishment, and plans, organizes, and implements training programs for all field and administration staff. He also liaises with government officials and local leaders in his area.

The *area leaf manager* assists the divisional leaf manager in all aspects of his job, but with less emphasis on planning and more on implementation and monitoring. Hence he spends more time with the field staff. He would be a university graduate in agriculture.

The *assistant area leaf manager* also generally has a university degree in agriculture. On the average, he is in charge of about ten field staff and 600 growers in a subarea of the division, who are expected to produce approximately 400–500 tons of leaf annually. To this end, he prepares and implements the area crop action plan, a more detailed extension of the divisional plan. He recommends his growers' input requirements, sets crop targets for his field staff, and monitors all field activities in his area to ensure that agreed crop and afforestation targets are achieved.

The *leaf technician* generally holds a certificate in agriculture. He has under him approximately three assistant leaf technicians and is in charge of an area with perhaps 300 growers. He is therefore expected to produce about 200 tons of tobacco annually. He also coordinates farmer meetings in his area, organizes all crop demonstrations, and visits his farmers regularly, particularly during the critical stages of the crop. In addition, he must liaise with the local government agents to ensure that they understand the company's plans.

The *assistant leaf technician* has usually passed secondary school "O" or "A" levels and is the agent who deals directly with the growers. He has approximately 70–100 growers in his area, prepares and implements a program to visit each farmer once every two weeks, and travels around to the farms by bicycle or motorcycle. He is expected to produce 60–70 tons of leaf annually. He assists the leaf technician in advising the growers and making sure that they implement the recommended agronomic practices properly and within the agreed time. He also distributes the recommended inputs and services.

The Transmission of Messages

The company believes that extension agents at the level of technician or below must clearly understand the divisional targets and objectives if they are to be effective. To facilitate this the following procedures are used to transmit messages from the management to the technicians and farmers.

Before the start of the season the divisional leaf manager's crop action plan is thoroughly discussed in a meeting of all field staff, and targets are either accepted by all or, if necessary, amended. At this time the goal is to get commitment from all staff and to satisfy them that the targets set for them are realistic and achievable.

The division action plan is then amplified further by the assistant area leaf manager, and copies of the amplified plan are given to the leaf technicians and their assistants, who use it as the basic plan of operations.

The divisional leaf manager and the senior field staff meet once a week to review specific aspects of the crop action plans. The divisional leaf manager holds monthly meetings with all field staff at which instructions for the coming month are issued. Daily or regular field contacts between the technicians and management further strengthen the system of communication.

Patterns of Contact

Contacts between the extension agents and the farmers take place at meetings (or barazas) with groups of farmers and on visits to individual farms. A tradition in most

divisions is to invite all growers to a baraza at the end of each crop season. At this meeting the divisional management reviews the performance of the growers in the previous season, pointing out both weaknesses and successes, and farmers' representatives give their version of the company's successes and weaknesses. The crop action plan for the coming season is then thoroughly discussed, and where necessary recommendations for amendments are agreed by the staff and the growers. In addition, field staff regularly hold barazas for the growers to introduce, demonstrate, or initiate a specific skill or crop activity in the current crop action plan.

The main contact between the agent and the farmer occurs on individual farm visits. By recruiting extra staff or changing the mode of transport, the company keeps the staff-farmer ratio within a range that enables the assistant leaf technician to visit each farmer once every two weeks. The ratios are 1:60–100 if the assistant travels by bicycle, and 1:100–150 if he uses a motorcycle. All other field staff, from management to the leaf technicians, are also in regular contact with the growers during their field visits for supervision and monitoring.

Monitoring and Evaluation

The success of the tobacco project is in significant part the result of an intensive monitoring system that all divisions use. Frequent field visits permit managers to compare the action plan with the actual field situation and to have on-the-spot discussions with the field extension agent. All staff submit weekly progress reports on the crops to their seniors; these are summarized by the area leaf manager for the divisional leaf manager, who discusses the results in his weekly meetings with his assistant managers. The divisional leaf manager's regular monthly meetings with all field staff are an occasion to review the crop action plan, amend it if necessary, and issue fresh instructions for the coming month. The proceedings and reports of these meetings form the basis of his monthly report to the leaf operations manager.

Financing of the Tobacco Project

The financing of the project involves both the operational costs of the program and the cost to individual farmers of inputs. The program costs are covered in the divisional crop budget, which is expected to be fairly accurate, realistic, and adequate. Once approved it cannot be amended without consultation with the divisional leaf manager. In this way the divisional leaf manager is held accountable for his budget and cannot claim cash shortages as an excuse if the agreed crop targets are not met. Once the company has approved the budget, it is committed to implementing the budget as drawn up and agreed and to ensuring that the necessary resources are available when and where they are needed.

To assist the growers in meeting their costs, the company (on behalf of the Agricultural Finance Corporation of Kenya) administers a credit program, and BAT undertakes to supply all registered growers with the

Table 3-1. *Credit Categories of Tobacco Growers*

Category	*General remarks*	*Outstanding loans (Kenya shillings)*	*Previous yield (kilograms per hectare)*	*Trees in woodlot*	*Barns*	*Area of tobacco permitted (hectares)*	*Loan limit 1984 (Kenya shillings)*	*Loan recovery rate required per sale (percent)*
3 star	Highest rating	None	1,800	2,000+	2	1	5,100	50
2 star		None	1,600	1,500+	1 large	0.75	4,600	50
1 star	Average farmer	None	1,400	1,000+	1 good	0.6	3,500	70
New farmer						0.5	5,300	70
Potential bad debtor		Up to 1,500 from previous year	1,200	500+	1 good	0.5	3,000[a]	70
Cash farmer	Below average, uncooperative	Over 1,500	< 1,200	< 500	?	0.5	All paid in cash	70

a. Inputs issued in stages, subject to satisfactory completion of previous crop operation.

necessary farm inputs and services to enable them to produce the required quantity and quality of leaf. It is BAT's responsibility to issue the inputs at the correct time and in adequate amounts, and to make sure they are true to type. To minimize bad debts, all the growers are divided into six main categories, and the limit of their seasonal loan is set by category (see table 3-1). Through the use of this system and subsequent close monitoring, the divisions are generally able to limit their unrecoverable bad debts to less than 1 percent.

Summary

The BAT tobacco leaf extension program has worked and continues to work for the following reasons:

- Objectives and functions are very clearly understood by all agents and everyone becomes committed to them.
- Crop action plans are very thoroughly planned, and targets are realistic and always achievable.
- The company recruits highly trained and skilled personnel and has a reward system that keeps staff incentives higher than in the public services, thereby ensuring that staff are fully committed to their jobs.
- The company undertakes to provide all necessary resources, both financial and otherwise, so that the crop plans are fully implemented without unnecessary delays.
- The monitoring and evaluation system allows early detection of any constraints affecting the program so that corrective measures can be taken quickly when necessary.
- All objectives and targets are quantified; thus every agent is clearly accountable to his superiors, and the reasons and subsequent rewards or penalties are known to everyone.
- Farmers are paid promptly for their tobacco—in the majority of cases on the same day the farmer sells his produce.

Paper presented at the African Workshop on Extension and Research at Eldoret, Kenya, June 10–16, 1984.

4

The World Bank and the Training and Visit System in East Africa

Nigel Roberts

By the end of 1983 the World Bank had committed, or was preparing to commit, more than $2 billion to projects associated with the T&V system. There were about a hundred of these projects in some fifty countries, including free-standing extension projects, research-extension projects, and multicomponent rural development projects. Of that $2 billion, approximately $1 billion was committed directly to extension for construction, vehicles and equipment, salaries, and other operating costs. More than twenty countries had adopted some version of T&V as their national extension methodology, either countrywide or in a major subsector. About twenty other countries had made use of T&V on a significant scale in subsectoral or regional programs.

Despite the evident appeal of the system, its popularization has not been free of controversy. This chapter discusses the nature of the controversy and suggests how some of the more valid criticisms might be addressed in the design of future extension programs.

The T&V System and Its Origins

One of T&V's more sympathetic critics, Jon Moris (1983), described the objectives underlying T&V in the following way. T&V, he wrote,

> attempts to equip junior extension staff with changing extension messages according to a two-week [cycle], and then through tight supervision to ensure they do actually work with specific contact farmers on a [regular two-week] schedule. At the core, the system aims at upgrading the technical content of field extension activities while making the field agents' contacts more predictable, and thus more accessible (to farmers) and more enforceable (by Ministry supervisors). The first of these two objectives requires direct links with agronomic research; that farmers' fields are used for conducting feasibility trials; and that attention is directed to the three or four most important innovations . . . The second objective—making the extension worker's field tasks visible and predictable—requires a simplification of Ministry responsibilities (preferably by the creation of a unified extension service and the removal of its regulatory and information-gathering tasks); an insistence that field staff should not take on other jobs like arranging input supplies or assisting community development; [and] provision of transport and incentives so that field tasks can be performed as planned . . . [T&V's] central innovation is the all-day training sessions which Ministry staff are supposed to arrange for all field agents on a 14-day cycle.

In essence, then, T&V is a set of managerial principles that are applied to agricultural extension. As Arturo Israel (1982) explains, the T&V system recognizes that in a geographically scattered operation some degree of discipline and clear lines of command are essential to achieve results: in the office and the factory there are wonderful tools for controlling performance, but they are not available in the circumstances in which T&V operates.

T&V was developed for the World Bank by Daniel Benor, the former director of the Israeli extension service. The methodology was first tested in Turkey and

then adopted widely in India and Southeast Asia in the middle and late 1970s; more than 70 percent of the externally financed investment in T&V by the end of 1983 had been directed to the Indian subcontinent and to Southeast Asia. An understanding of the reasons for T&V's appeal in India is important when considering the relevance of T&V to Africa, where conditions are often so very different from those in the subcontinent.

Many people agree that extension was the weakest link in the small-farmer agricultural development package in India in the early 1970s; in many other respects the agricultural environment was conducive to the widespread and rapid dissemination of new technologies. There was a backlog of poorly disseminated research results (based on emergent Green Revolution technologies); inputs and credit were freely available, thanks to a well-developed private sector; grain markets functioned reasonably efficiently; input-output price relationships were attractive enough for farmers to invest in new technologies; and the country's infrastructural base was sound. An effective technology transfer system was lacking, however. Extension efforts were poorly focused, with too little attention paid to the provision of technical advice (as opposed to the provision of economic and community services); programs had little inspiration, no credibility, and insufficient funds; effective working relationships between researchers and extensionists were a rarity. T&V entered the arena at a time when extension reform was a priority item on the agricultural development agenda. Because the preconditions for successful extension were in place, T&V was able to deliver results—to complete the circle, as it were, and thereby to boost production. Visible results were often achieved early, and agricultural policymakers, seeing these, became advocates both of effective extension and of the system that embodied it.

The T&V system appealed to policymakers because it proposed a method whereby large and moribund extension organizations could be mobilized at a small incremental recurrent cost. T&V put extension personnel to work through a tightly organized management approach—something extension had lacked in India and in most developing countries. The increased efficiency was obvious, and the impact on production was apparent to many initially skeptical observers. The T&V seed fell on ideal soil in India: on the one hand, effective extension was absent, was seen to be necessary, and was blessed with the preconditions in which it would thrive; on the other, the deficiencies in the technology transfer system were above all deficiencies in the management of the extension and research bureaucracies—exactly the type of situation T&V is best suited to deal with.

The Controversy

Let me now turn from Asia to East Africa and discuss in this context the undeniable controversy that surrounds the T&V system. In doing so, I draw on the work of John Howell of the Overseas Development Institute in London, a prominent commentator on T&V. He has for several years served as a conduit for an international debate on T&V among academics, aid administrators, and extension managers, and in a number of ODI discussion papers he presents contrasting views on the system. In his 1984 paper, for example, Howell distinguishes between what he calls the "nonissues" and the truly "contentious issues" surrounding T&V.

Nonissues, according to Howell, are criticisms which fault T&V for failing to accomplish things it never claimed to do in the first place. An example of this is the criticism that T&V cannot operate successfully in the absence of an effective research program. Most proponents of T&V would agree: the system is designed to transfer technology, not to create it; T&V assumes that a functioning research apparatus is already in place. This particular criticism has no doubt been encouraged by past mistakes. T&V programs have on occasion been established where research institutions were inadequate and where no sufficient technology base for productive extension existed. A clear example of this is Somalia, where for several years the World Bank–funded extension service, out of necessity, attempted to conduct its own adaptive research program in order to derive a stock of viable extension messages. This was a costly and sometimes ineffective process that has eroded the credibility of the research service. Now, however, the World Bank is very wary of establishing new T&V projects in areas with a poor adaptive research capacity. Normally, a preexisting or concurrent investment in research by an external agency is a precondition for the Bank's involvement in extension.

Another related nonissue is the complaint that T&V cannot increase production unless the complementary parts of the small-farmer development package alluded to previously—input supply and credit, market mechanisms, and price incentives—are in place. Again, this is something few T&V advocates would dispute. Perhaps some T&V designers have overlooked the importance of such factors—but not often, and very rarely now. In Ethiopia, for example, widespread World Bank involvement in the development of the national extension service has been held back for more than two years, despite a highly successful T&V pilot project. The principal reason is that the incentives and services available to farmers—in particular, officially determined fertilizer-to-grain price ratios and output marketing

rrangements—are not judged to be sufficiently attractive to induce investment in available new technologies. Implicit in this decision is the recognition that extension is only one cogwheel in the agricultural machine, and rarely the most important one at that. This point is made forcefully by Donald Pickering in chapter 1.

Howell's discussion then turns to contentious issues—that is, issues on which there is a genuine debate. For example, he refers to the argument over the use and selection of contact farmers in T&V. These contact farmers are usually selected by the extension service and are supposed to represent the range of socioeconomic groups found in a particular local society. Critics argue—and I would agree with them—that in practice local pressures and staff preferences often tend to bias selection in favor of the richer or more powerful farmers. Some people are concerned less by operational problems, however, than by the whole concept of contact farmers, which they find misguided. Guy Belloncle, for one, claims in chapter 7 that the use of pilot farmers or farmer-leaders can only represent profound insensitivity to the egalitarian social structures found throughout traditional African society. Belloncle's remarks are in fact linked to a more fundamental criticism of the whole T&V system—that it is top-down in its orientation, and that it responds more to the desired modus operandi of the bureaucrat than to the needs of a community and its farmers. The question of whether T&V encourages true farmer participation in the research and extension process is an important and a valid one, and I will return to it later.

A second contentious issue is the cost of T&V. In discussing costs, Howell is not concerned with the economic justification for T&V, nor even its cost-effectiveness as compared with other dissemination methods such as radio. Recent studies (Feder, Slade, and Sundaram 1985; Feder, Lau, and Slade 1985) are encouraging in their assessment of both these questions, albeit in the Indian context. For Howell, the issue is rather the financing of T&V. In Africa T&V development has involved either a major buildup of personnel in the extension service or the injection of critical funds to cover operating costs, which extension has long been denied; a relatively costless reorganization of an existing program is not enough. The concentration of effort associated with successful T&V therefore tends to be expensive, and under today's constrained budgetary scenarios it is not generally something that African governments can afford without a good deal of external assistance. And although the economic benefits from T&V may indeed be considerable, they may not be captured as government revenue—let alone reflected in greater budgetary allocations to extension. As Howell also points out,

> the difficulty is that extension services have no built-in mechanism for direct cost recovery—unless linked to commodity boards in the case of specific crops (like tea, rubber, etc.); yet they appear to have a built-in mechanism for continuing increases in local recurrent costs (as more farmers are included in the program and as farmers make more demands on the services). Even without this trend, externally assisted extension projects (in the T&V mold) bequeath a high level of recurrent expenditure.

I would agree with Howell that in adopting T&V governments run an implicit risk that the resultant cost burden may not be easily sustainable without continued external assistance. I will argue later that this problem has now begun to be recognized clearly and addressed. The question of actual cost recovery, however, is one that has so far elicited little real interest from T&V designers—and I believe it should. I shall return to this set of issues, too.

But above all, the controversy surrounding T&V has been generated by a perception that the World Bank is selling the methodology as *the* universal extension system, and that it is often doing so inflexibly and with little sensitivity to the needs of particular situations and countries. When this has happened, I would attribute it in part to the overenthusiasm and inexperience of people like myself who, without really appreciating the difference in circumstances, brought T&V out of Asia into a new environment—and in part, let it be said, to the introspective tendencies of all large organizations, which are always tempted to replicate successful experiences without looking too far out of the window. Because of their inexperience, Bank staff did not always distinguish between the forms of T&V found in India (the fortnightly visit, the monthly research-extension workshop) and the principles underlying these forms (the need for regular on-farm visits and for systematic contact between research and extension). As a result, in the design of some African T&V projects, there have been instances not only of unnecessary rigidity, but also of random modification: project designers have selected one or two features of T&V that seemed to them attractive, without focusing on the principles that underlie good extension.

It is, however, a perceived methodological rigidity that has drawn the most adverse comments. I would argue that this is largely something of the past: experience has taught most of us to be less doctrinal. A few years ago there was a good deal of discussion of the extent to which T&V could be modified. Arturo Israel

(1982, recalled in his 1984 paper) articulated a commonly held view when he wrote that "a cluster of essential T&V elements . . . must exist in a cohesive package for the successful application of the system. The selective application of only a few . . . elements defeats [its] interactive dynamics." Lists were drawn up of the essential elements—Israel, for example, suggested that the T&V package must include an exclusive focus on extension, a single line of command, a fixed schedule of properly supervised visits, reasonable staff-farmer ratios, systematic and continuous training, continuous linkages with research, minimal paperwork and administration, explicit field orientation, and the pursuit of incremental changes in the farming system.

But in reviewing a T&V-derived extension system in Burkina Faso, Israel (1984) wrote that "the Burkina case shows, in particular, that the T&V system may be modified significantly, retaining only a few core qualities . . . and still have a positive effect on agricultural performance. Indeed, the high degree of adaptability found in Burkina T&V probably enhanced its effect." The evidence from Burkina Faso as interpreted by Israel is that successes can be achieved even with a rather mangy version of T&V, consisting of little more than "relatively time-bound work, fixed training and visit schedules, tight supervision and field orientation."

Recent World Bank involvement in testing T&V under East African conditions suggests that any list of essential characteristics can be quite short. I have seen a number of what I believed were key principles of T&V omitted from Bank-assisted projects apparently without catastrophic effects. In Sudan, for example, where the traditional inspectorate system in the irrigated cotton corporations is undergoing reform, inspectors will continue their direct management of land and tenants as well as provide extension advice. In the Comoros extension agents must perforce be involved in input supply because at this juncture there are neither private suppliers nor other government staff to do the job. In Ethiopia the integrity of the chain of command is maintained only by a compromise in which agricultural coordinators at the district and regional level delegate technical authority on extension matters to extension officers on their staff. In every case T&V is making or is expected to make headway, and I see little evidence that these necessary departures from the ideal will cause insurmountable problems.

Indeed, I would now argue that there is a rather simple way of looking at what is or is not essential to the success of the system. T&V is characterized by its rhythm of regular training sessions and on-farm visits, and the goal of the designer should be to ensure that this training-and-visit continuum is effective. Doing so requires setting up a coherent management structure, which in the classic Indian context exhibits such features as systematic supervision and an unambiguous chain of command. But there is no reason why the constituents of the management system cannot be varied, so long as they deliver the goods. Viewed this way, the issue with T&V is not whether one can or should "go by the book," in the literal sense of reproducing the format described in the T&V pamphlet; what matters is understanding why classic T&V has the characteristics it does, then applying that understanding to an analysis of one's own situation. At this point, it becomes less fruitful to talk of what is needed to achieve an effective T&V program than to discuss what is needed to ensure good extension.

In other words, T&V offers the extension designer not so much a blueprint for an extension system, but rather a repository of extension principles from which to draw—principles that should ideally underlie any effective extension organization in a developing country, but which cannot at all times be held up as inviolate. Having said this, however, I do have my own list of features that I would recommend for any African public sector extension system I have been associated with: regular visits to clearly identified farmers or farmer groups, regular and frequent staff training, in-the-field collaboration between researchers and extensionists on technology generation, a clear chain of command in the extension service, and the provision of adequate means and incentives to staff (including transport and personal allowances). When international financing agencies are involved, I would also hope to find a design process in which there is true collaboration between agency technicians and governments and in which new systems are tested on a pilot scale before national replication; both of these courses of action diminish the risk of implanting unsuitable methodologies. Also of great importance is that external financing agencies should normally be prepared to commit themselves to an extended period of support for a new extension approach—say, ten or even fifteen years. Part of the chaos in African extension can be attributed to erratic and unpredictable donor support, a situation in which no new methodology, however sound, is likely to flourish.

The World Bank, in its extension work in Africa, has promoted the adoption of sound extension principles in the context of non-T&V as well as T&V projects. There is ample evidence that the Bank's commitment to T&V does not prevent it from giving substantial support to other distinctly different extension approaches. This is a necessary and desirable situation in Africa, with its great diversity of resource bases, extension traditions, infrastructure development, and civil service efficiency. An obvious example of this is Bank support for the ver-

tically integrated systems of the West African cotton companies, in which the company provides extension advice as part of a package of services that includes supplying inputs, credit, and marketing. Indeed, the World Bank sponsored the Eldoret and Yamoussoukro extension workshops for the specific purpose of comparing different extension approaches—not in order to promote any one methodology, but to explore the strengths of different approaches and thereby to facilitate cross-fertilization among them.

Unanswered Questions: Participation and Costs

T&V designers have not yet done justice to two issues: true farmer participation in the design and management of research and extension programs, and the control or recovery of recurrent costs.

T&V is often criticized as a top-down or supply-driven approach. In one sense this criticism is unfair because the T&V methodology provides for specific channels of feedback and communication between farmers and researchers. In practice, however, it is not uncommon to find extension staff distributing undifferentiated blanket recommendations to farmers, making no concession to their varied economic capacities and widely different farming systems. Recommendations are frequently prompted not by farmers' expressed needs but by the bureaucratic and academic imperatives that drive much of the on-station research in developing countries, and extension subject matter specialists are often insufficiently expert to modify these recommendations to fit local requirements. This pattern of advice signals a fundamental breakdown in the extension process—which should indeed be a two-way communication system. I agree with Michael Collinson (1982) and other proponents of farming systems research when they point out that the critical break in the research-extension-farmer chain occurs not between research and extension, but rather between the research and extension establishments on the one hand and the farmer on the other.

Participatory or democratic research and extension approaches attempt to generate a cooperative relationship between researchers, extensionists, and farmers through intensive dialogue and shared work at the farm level. Examples are the *recherche-développement* methodologies being used in the Comoros and Rwanda under the guidance of experts associated with the Institut de Recherches et d'Applications des Méthodes de Développement (IRAM), the new structures being tested by the Compagnie Malienne de Développement des Textiles (CMDT), and the farming systems research (FSR) approaches sponsored by the International Maize and Wheat Improvement Center (CIMMYT) and the U.S. Agency for International Development (USAID). All of these methodologies are able to break down unnecessary institutional barriers, identify specific production problems, and involve farmers in designing solutions to them. As a result, they have much to offer T&V—not least the on-farm training which can turn extension's subject matter specialists into true experts. Similarly, because T&V has the ability to organize public servants for the broad dissemination of information, it can effectively publicize the relevant results derived locally from participatory farming systems research. Along with many others (for example, Rivera 1985; Moris 1983) I believe that this natural symbiosis between T&V and FSR may well offer the best avenue for the future development of both systems. Much can be gained through the joint efforts of national extension designers, the World Bank, and bilateral financing agencies to integrate the two approaches systematically, as they are beginning to do, for example, in the Comoros, Malawi, and Zambia. One obvious fruit of such a union is the increased accountability of extension agents to farmers' groups—which suggests the possibility that farmers' groups might in time be induced to pay part or all of the costs of an extension agent who is increasingly seen as their employee rather than a government servant.

With regard to the costs and the financing of T&V, I have mentioned Howell's concern that the T&V system may not be sustainable in some African countries without permanent external support for its recurrent expenditures. His concern is legitimate, given the history of much externally supported extension in East Africa in the 1970s. Indeed, T&V has often been introduced where extension efforts had run down or collapsed after the previous cycle of donor support came to an end. All too frequently, the earlier projects left behind them large staffs whose work program had been supported by external contributions. Often this meant that ministries of finance and agriculture had managed to avoid committing a significant quantity of local funds to the system at its inception and were unwilling or unable to finance the entirety at a later stage. The common result was that the staff of the extension project continued to be employed, while the project's operating costs (maintenance and fuel for vehicles, staff allowances, and training) were cut. No system that relies on mobility and on constant interaction can function under these conditions.

If this problem is to be averted, three related courses of action need to be considered when designing extension projects. First, it is clearly necessary to confront the recurrent financing requirements of a new extension approach squarely from the outset—and to do so at a central or sectoral level, where governmental prior-

ities for agriculture are established. Unless this is done it is not likely that sensible tradeoffs can be made between optimal and sustainable extension designs. Nor can there be any realistic assessment of the support that a government might provide over the medium term. (Government commitment would in turn signal lenders the extent to which they must discipline their design recommendations and the length of time for which they may need to provide support.) Often this type of exercise can be done only in the context of a sectoral public expenditure or program budget review.

Second, it is important to search for ways of holding down the overall costs of any new system. Although this needs to be done more systematically than it has been so far, it is clear that T&V in East Africa is emerging as a leaner creation than its Indian forebear. It has generally been argued, for instance, that in African countries the T&V approach should focus on the agricultural areas which have the highest potential and for which transferable research results are more likely to be available or in the offing. Several experiments are afoot in which the classic visiting schedule of T&V is being diluted: monthly instead of fortnightly visits can halve the number of agents required to serve a given area, albeit at some cost to the desired degree of contact. Plans exist to test the partial substitution of radio broadcasts for face-to-face contact. It is also planned to rotate the efforts of a deliberately small cadre of professional extensionists through different regions of a country in sequence; the initial, intensive phase of extension in an area would be followed by one in which farmer representatives would be the major providers of extension services.

Third, much more consideration ought to be given to recovering extension costs from beneficiaries. With the progressive elimination of price and tax biases against farmers in recent years, the economic argument in favor of levying user charges for extension in certain situations is growing stronger. Many people will still contend that the idea is impractical—that African subsistence farmers will not willingly accept charges for such a nebulous commodity as extension advice, the benefits of which cannot be confined to the paying customer—but this is often only a contention. Few serious attempts have been made to test the idea of cost recovery in African extension outside the vertically integrated commodity schemes (such as the French Company for the Development of Textiles [CFDT] and its derivatives, the Sudanese cotton corporations, and British-American Tobacco Limited), which recoup their extension costs by controlling marketing and by levying a tax on output.

As farmers' research and extension groups become integrated with public sector extension, as seems likely in African T&V, such groups may wish to exercise the type of control over their extension agent that a financial relationship implies—particularly if the group is thereby able to purchase a more intensive or a more sophisticated service than it would otherwise have. The advantage for governments of such a development seems clear: fee-paying associations could help relieve extension's burden on the public treasury. Of equal interest is the prospect of introducing a true consumer evaluation of extension. If farmers were free to purchase extension or to do without it, the result could be a system that is more responsive to the demands of the marketplace. The type, quantity, and sophistication of extension services offered would be dictated by farmer demand and not, as now, by extension designers and administrators. Evaluation would be taken out of the hands of external funding agencies and government monitoring and evaluation units and given over to those best placed to judge the quality of the service provided. This attractive prospect should claim some of our attention in the years ahead.

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5

A Few Questions on the Training and Visit Method

Dominique Gentil

The training and visit (T&V) system has spread rapidly: about ninety World Bank–financed projects are using or are influenced by this method. Is it, however, an original system or simply a systematization of known practices?[1] Is it really as efficient as people claim? Is it applicable to all situations? To what extent can and should it be adapted?[2] Despite its claims to the contrary, is it not in fact a very expensive system, since it multiplies the number of extension agents and also makes it necessary to create new posts for functions such as input distribution and the collection of statistics that were formerly fulfilled by multipurpose agents? Before tackling these questions, however, we should place extension in a more general context.

The Context

Successful extension is only one of several factors that explain production increases. The importance of extension in increasing production is not so universally accepted as is the importance of climate, the expansion of cultivated areas (rainfed and irrigated), the technical package, the pricing of products and inputs, and infrastructure (marketing, supply, credit, and so on). For example, *The Economist* (August 18, 1984) drew attention to India's record crop of 1983–84 (about 156 million tons, compared with the stagnation at about 130 million tons annually in the previous five years) and enumerated the factors responsible. According to the author, they included a good monsoon, the impact of Green Revolution technology (seed, fertilizer, and pesticides in combination with irrigation) on wheat and rice in certain regions, considerable fertilizer subsidies, and an increase in the guaranteed price. Extension was not mentioned.

Although extensionists may all agree in principle that many factors contribute to production increases, not all of them adhere to this frame of analysis when drawing conclusions about a particular extension system. When considering the efficiency of an extension system, it is essential to take into account the effect of other factors, such as prices and credit policies, and to examine whether they have changed over the period in question. Unfortunately, this is not always done.

When evaluating extension systems, one should specify the methods used to analyze the portion of impact ascribed to extension—not an easy task in methodological terms. In India the comprehensive study by Feder and Slade (1983) focused on "the extent and quality of agents' contact with farmers and the degree to which impact points are adopted. These activities were complemented by yield measurements . . . This simple approach . . . reflects the difficult methodological problems that must be overcome in any attempt to attribute productivity effects to extension." With regard to the economic analysis of the impact of extension, one must specify—and justify—the percentage of production increase being ascribed to the extension system and take full account of the incremental costs (for example, the added costs of input distribution and data gathering if the extension agent is not now fulfilling those tasks). This does not generally appear to have been done, as Orivel shows: "In evaluation studies of World Bank projects in this field, the rates of return are very high—due in part to the fact that increases in yields are ascribed entirely to the project, although the latter has merely reinforced a pre-existing extension system that

was not itself without cost" (Perraton and others 1983).

An extension system cannot be analyzed in and of itself, but must be examined in the context of the innovation being transmitted. In other words, to quote Cernea (1985), one must study the "medium and the message" together. It is regrettable that most reports on extension discuss dissemination methods at length, but only rarely mention the innovations that are the object of dissemination. The type of extension system that is appropriate, however, will depend greatly on what messages need to be conveyed.

Innovations can be classified in various ways. Among the most important is the extent of the changes to be brought about by the innovation. A simple innovation, such as the introduction of a new seed variety, usually leads to little change in the production system (unless it requires fertilizer and irrigation). An innovation such as animal traction, however, has consequences that fan out into the whole production system—one can use the metaphor of a stone thrown into water. Animal traction is introduced to improve soil preparation and to permit more frequent weeding, but it has numerous repercussions on sowing dates, the organization of work within the family, the care and feeding of animals, manure production, the financial equilibrium of the farm, the increase of cultivated area, the land tenure system, and social relationships in the community hierarchy. The most complex form of innovation is one that implies a profound change in the production system. To fight declining soil fertility in the Sahel, for instance, it is necessary to coordinate agricultural, sylvan, and pastoral activities and thereby to promote such initiatives as soil conservation, reforestation, the use of manure, new crop rotations, and cereal-legume associations. This type of land management requires a reorganization of farms and also of villages, given the implications for collective action.

In addition, innovations may be classified according to their cost-effectiveness in relation to cash investment and work time; according to the risks involved in their adoption (most proposed innovations are efficient in an average year but are often less productive than the traditional techniques in the event of drought, high winds, or pest attacks); and according to the length of time that will elapse before results can be seen—for certain innovations (fertilizer, for example) the results can be spectacular right from the start, whereas in other cases (the fight against declining soil fertility) they may not be visible for three to five years.

It follows that innovations are most easily accepted when they do not entail any major change in the production system, when the ratio of additional cash income to the monetary cost of introducing the innovation is sufficiently high (many farmers will not be motivated to make a change unless they can earn two or three times what they put in), and when results are immediately visible. Acceptability is likewise increased when the additional amount of work required is not too great. Contrary to the calculations of those economists who consider the marginal cost of a day of farm labor to be nil in many situations, farmers themselves attach a great deal of importance to extra work, as all studies have shown. Experience suggests that prospects for the adoption of an innovation are slight if the increase in work required is greater than 25 percent. And finally, an innovation should not entail excessive risk. The degree of risk that is acceptable varies considerably, depending on the ecology of the region and on the type of farm. In sum, farmers are usually interested in maximizing their monetary income in relation to a given amount of work (that is, in increasing the return per unit of time) with a minimum of risk; this often creates misunderstandings with those agronomists whose bias is toward maximizing production (that is, toward increasing the yield per unit of land).

Innovations are also more acceptable when they are compatible with the socioeconomic realities of the farm system. For example, farmers may prefer extensive agriculture if they are trying to stake a claim to a desired piece of land; work groups may be preferred to animal traction if a key objective is to maintain a network of clients; and farmers may stop at a certain production level because they have reached their satisfaction threshold or simply because there is nothing to buy with any added income.

To repeat, the methods and the approach espoused by extension need to be in accord with the type of innovation required. In the case of a simple innovation with excellent benefit-to-cost prospects, diffusion often takes place without difficulty. The main problem is one of logistics (inputs need to be available at the right time and in sufficient quantities), and the use of mass media along with demonstrations conducted by a small team of government staff should be sufficient for extension purposes. But when a significant reorganization of a production system is necessary and involves a degree of collective effort—in pursuit, for example, of reforestation or erosion control—then a cadre of technically competent staff who are able to establish a sophisticated dialogue with farmers will be needed.

For centuries farmers have been the innovators of most technical progress in agriculture. The process of experimentation and adaptation continues at the individual and collective level, although as problems have grown in complexity in recent times farmers have often been unable to find solutions. Nonetheless, an innova-

tion is accepted much more easily when farmers themselves have participated in its development; it is also more easily adapted under these conditions. In addition, an innovation is more readily disseminated when it responds to problems felt by a society in crisis and when the socioeconomic transformations that it engenders appear compatible with the social equilibrium of that society.[3] And let us not forget that many recent innovations (such as flood-recession sorghum in northern Cameroon) have been disseminated without the help of extension (see Stavis 1979).

Two further points are worth making. First, extension approaches must be adapted to the diverse agricultural environments they are addressing—to varying ecological conditions and farming systems and, within individual farms, to differences between members of the farm family. Second, extension theories and methods are usually based on an excessively simplified communication model that bears a limited relation to reality. The model is often borrowed from communication theory and posits a system in which ideas flow from originators (researchers) through disseminators (extensionists) to receivers (farmers)—with feedback returning along the same channel. If one thinks of extension in terms of innovations, however—their production, acceptance, and diffusion—then this type of model describes only one element in a much more complex communication process.

The Applicability of the T&V Method

Although the data available from various monitoring and evaluation exercises are still inadequate, it is nonetheless possible to draw some conclusions about the effectiveness of the T&V system. It is clear that T&V's rigorous organization can make profitable use of a cadre of existing but underutilized extension agents (a common situation when the system is introduced). T&V also upgrades the caliber of the extension agents by means of continual on-the-job training and increases contact between extension agents and farmers. It is often able to ensure that available research data are actually used; this can reorient research to focus properly on problems of importance to farmers. In place of a top-down extension method, more emphasis is placed on feedback and on the two-way flow of information. It may often be wise, however, to determine whether farmers are really being listened to, or whether only a few of the more "acceptable" opinions are being filtered up.[4] Sometimes the upward flow of information does not take place—or takes place sporadically—because the extension system is set up to permit information to flow downward from those who know to those who, supposedly, do not know.

Although in most cases the T&V system does represent a real improvement over the preexisting extension system, some questions remain. The first is whether the system can function only when a number of specific conditions are present—such as the existence of effective recommendations from research, a relatively simple technical package (innovations of the simple type described above), an agriculture characterized by regularity and continuity, the availability of relatively large numbers of subject matter specialists and extension agents, and reasonably effective facilities for marketing, credit, and input supply, whether private or parastatal.

It is surely no coincidence that the T&V system functions particularly well in Asia, where the technical package (seed, fertilizer, pesticides) is relatively simple for crops such as rice, wheat, and corn, and where irrigated areas allow uniform sowing dates and control of agricultural tasks (a situation approximating that of a controlled milieu in research). But these conditions are often not present in the Sahel and elsewhere. Farmers in many countries in which my research institute, IRAM,[5] has been involved (Bolivia, Burundi, Comoros, Haiti, and Rwanda) have complex cropping systems and highly varied ecological conditions—and their techniques differ by year, altitude, and soil microconditions. In these countries research structures are remote from the realities of farm conditions, manned by a limited number of competent technicians, and hampered by unreliable supervisory structures. What is to be done in such countries?

Another question is whether the T&V system will continue to deliver good results after a number of years of operation. A new system will always tend to function well for the first few years, since everyone is mobilized to make it work. But then the work becomes routine, and lassitude can set in among both supervisors and farmers. This is especially true if, after the first relatively simple technical package has been delivered by research, no new and easily acceptable innovations are forthcoming (research results are often obtained only five to ten years after work begins on a subject).

Other questions concern the costs implicit in such a system and the possibility of bureaucratic growth that will later be difficult to reverse. In Thailand, for example, there were 2,384 agents in the extension department in 1975, 6,673 agents in 1977 when T&V extension was launched, and 10,865 agents in 1982 (Cernea, Coulter, and Russell 1985).

If the technical package to be disseminated is fairly simple, would it not be possible to achieve the same re-

sults with a much smaller organization? And when there are many extension agents, is there not a tendency for the system to become oriented toward the agent and his needs rather than toward the farmers? Would it not be preferable to use the resources spent training agents, monitoring their work, writing reports, and managing their work on analyzing farmers' problems and training leaders from among them? And finally, if the problems and technical solutions are complex, can young extension agents with a low level of technical expertise really be effective in dealing with them?

Compatibility between Farmers' Problems, Technical Innovations, and Channels of Dissemination

A "universally applicable" extension system is likely to be oversized or undersized for a particular situation and to neglect farmers' real problems. As I have mentioned, depending on the type of innovation, the methods and structures of extension need to be very different.

Although certain basic T&V principles (the organization of extension agents' work, the regular training of staff, close liaison with research, promotion of a two-way flow of information) are of importance, the procedures used in certain research and development (*recherche-développement*) projects appear to offer rather more of value to extension. Under these procedures, one would start with diagnosis—by determining the location and modus operandi of the various types of farms in an area and by assessing their main constraints and potential. This initial diagnostic exercise can be carried out relatively quickly with more precise work to follow in support of specific interventions. Next, one would experiment in this rural context with different innovations designed to respond to the problems that have been identified. Finally would come the dissemination of innovations through the channels best suited to the specific innovation (visits to and exchanges of experience among farmers, training sessions for farmers, regular contacts between extension agents and farmers, use of mass media, and so on).

Cost-benefit criteria should ideally feature in the selection of the dissemination channels. But there are few studies in this area to give guidance. Perraton and others (1983) discuss the difficulties inherent in extension evaluation—the absence of a true control group; the lack of a typology of extension; the inadequacy of most statistics and the difficulty of correlating them; and the absence of a standard definition of costs, which makes comparison difficult. Even when data are available, they are often not very useful because they do not all relate to the same type of innovation. For example, figures can be produced to show that it costs less to deliver an extension message by radio than by using traditional face-to-face contact by extension agents—but assertions to this effect do not make much sense because the two media do not carry the same message and are inherently suited to doing different things. It is also important to know what criteria are used to evaluate the system—does success depend on whether the information was received, on whether it was applied, or on the size of the yield obtained? Results will be very different depending on the criterion chosen. In addition, face-to-face extension and mass media usually are most effective when used together, and in these situations it is difficult to separate their contributions. It would undoubtedly be more productive to compare the impact of various combinations of approaches on a given production problem.

Conclusion

The most important point to underline is the need to build a sound relationship between farmers, extension workers, and researchers. The most successful extension experiences in Europe and the United States have been those in which extension workers are employed by a farmer organization capable of exerting pressure on the research establishment. Although this situation is probably impossible right now in much of the developing world, one can still invoke the rule that farmers must necessarily be an integral part of the process of diagnosis, experimentation, and dissemination. The knowledge derived from researchers must be systematically confronted with the knowledge accumulated by farmers, and extension work must be managed by the state and the farmers in cooperation with each other. In France, for example, extension is managed jointly by the state and by organizations that represent farmers; the funds used for extension come both from producers' sales taxes and from public funds. In an interesting experiment in English-speaking Cameroon, the state paid the salaries of extension agents who were seconded to the Cooperative Union, while the union paid them bonuses based on the quality of their work. Producers' associations can become partners in the research and extension process not only by assisting in the dissemination of techniques but also by helping to define problems and develop solutions that can be mastered by farmers of varying abilities on different types of farms.

The T&V system represents an improvement over most existing systems, but it works only in some contexts and is relatively costly. Other approaches—in

which diagnosis, experimentation, and dissemination are managed jointly by researchers, developers, and organized farmers and in which dissemination methods are geared to the type of innovation to be extended—would often appear to be less costly and better suited to specific environments.

Notes

1. In French-speaking Africa, for example, similar extension methods are employed in the context of traditional crop-intensification and production operations promoted by the Société d'Assistance Technique (SATEC), Bureau pour le Développement de la Production Agricole (BDP), and Compagnie Française pour le Développement des Textiles (CFDT).

2. According to Benor and Baxter (1984), "it must be clear that the basic principles of the system must be well understood, and that there is no room for significant variations in its basic features."

3. Braudel (1980) shows that "an innovation is only as effective as the social pressure that upholds and imposes it . . . Real discoveries will remain unexploited (sometimes for one or two centuries) if nobody needs them or envisages needing them . . . As long as daily life goes along without difficulty in the context of inherited structures, as long as society is content and at ease with its customs, there will be no economic motivation for change. Inventors' projects will remain in their wrappings. It is when everything is going wrong, when a society has come up against the limits of the possible, that the recourse to technology imposes itself naturally, that interest is awakened for the thousand and one latent inventions, the best of which will overcome the obstacles and open up a different future. For hundreds of possible innovations are always present, hibernating, so to speak, until one fine day it becomes imperative to awaken them." See also remarks of Boserup (1965) on the dissemination of innovations in the presence of demographic pressure. I have also been told that in a village in Mali, water will be hauled manually if it is done by former slaves, whereas the pulley and animal traction will be used otherwise.

4. In Dosso, Niger, for example, extension agents merely gathered farmers' opinions on agricultural techniques, although the farmers themselves were preoccupied above all with the availability of inputs.

5. Institut de Recherches et d'Applications des Méthodes de Développement.

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6

The Design of T&V Extension Programs for Small Farmers in Ethiopia

Alemneh Dejene

This chapter is based on a field evaluation of the training and visit (T&V) pilot extension projects and the impact of extension activities under the first integrated rural development program in the Arssi region of Ethiopia (Dejene 1986). The extension strategy and program activity of the Arssi Regional Development Unit (ARDU) was found to be well designed and implemented. After more than a decade of Swedish funding, Arssi had a larger number of more experienced extension agents and much better transportation and adaptive research facilities than any other region in Ethiopia.

When smallholders were asked to evaluate the ARDU extension services, however, 79 percent of the respondents indicated that the agents were not assisting them with their farming. There was no fixed schedule of visits from the agents, and information was not given systematically nor did it reflect the changing agricultural cycle. The productivity of the ARDU extension services was clearly low, and the national extension programs run by the Ministry of Agriculture faced even more serious problems.

The factors contributing to this low productivity are examined in some detail here. The most important ones are that the extension organization does not reach farmers directly; information is not given regularly to farmers; efforts are not concentrated on agricultural production; there is no clear chain of command for extension staff and only limited in-service training; and there are no links between farmers, extension agents, and researchers. In the pilot project areas I examined, however, the T&V system has shown a remarkable ability to address these problems of management and supervision. It is primarily for this reason that I propose the adoption of T&V extension in the relatively fertile regions with adequate rainfall in Ethiopia.

The Origin and Organization of ARDU

The Chilalo Agricultural Development Unit (CADU, 1967–74) was one of the earliest examples of an integrated rural development project (Nekby 1971). Under CADU, the dominant activity of the extension system was the distribution of inputs (fertilizer and improved seed) and the dissemination of improved practices for raising crops and animals. To disseminate and adapt these innovations, CADU used demonstration plots (usually located near a major road, church, or marketplace) and the "model farmer" approach (Bergman 1970; Tecle 1975; Gebregziabher 1975). Extension activities were focused on a few selected farmers who would then demonstrate to neighboring farmers the advantages of improved agricultural techniques and products. This strategy led to an increase in the average yield of wheat in the project area from 9.6 quintals per hectare in 1968 to 15.8 in 1972, and an increase in total production from 26,000 tons to 74,000 tons over the same period (Hunter and others 1974).

After the Ethiopian revolution and the agrarian reform of 1975, the CADU approach was extended to cover the whole Arssi region, and the Arssi Regional Development Unit (ARDU) was created. The 1975 Rural Land Proclamation nationalized all rural land, abolished tenancy, and allowed farm families to cultivate up to ten hectares of land. Partly to implement the land reform and partly to promote and administer the future development of peasant farmers, peasant associations were created. There are now more than 25,000 peasant associations in Ethiopia, 1,085 of them in Arssi.

Under ARDU, the model farmer approach was abandoned and CADU's "excessive" emphasis on improved

technology was criticized. A distinction was made between social and economic objectives. The social objectives became collective action and the creation of a self-reliant cooperative community, rather than an increase in the productivity of certain individuals. The economic objectives were the continuation of the agricultural "package" approach of CADU and the promotion of industrial cooperatives and of resettlement (ARDU 1976).

To attain these objectives, ARDU was reorganized into six departments. The Extension Department remained the principal unit, but its name was changed to the Extension, Education, and Cooperative Promotion Department to emphasize its orientation toward cooperative development and nonformal education.

There are now approximately 145 extension agents (known as rural development agents, RDAs) working in the district development offices and rural development centers. Three RDAs are assigned to each rural development center, the lowest administrative unit in the system. RDAs are multipurpose agents who distribute improved inputs, disseminate advice on the technical components of the project, and work with selected "production groups" of farmers from each peasant association in connection with the development and promotion of cooperatives. The RDA also works with the women's and youth associations of the peasant associations, particularly on the improvement of literacy and political awareness. At the district level the RDA collaborates with the District Revolutionary and Development Committee to integrate local plans into the district and regional development plans (ARDU 1984).

Because of the wide variety of responsibilities of the RDA, the dissemination of agricultural innovations among small farmers has been very limited since 1975, except for fertilizer use. The diversity of tasks drastically reduces the amount of time an extension agent can allocate to technical problems. In addition, ARDU spends most of its extension time and resources in helping farmers who belong to producer cooperatives in which land is cultivated communally. There is no law, de jure or de facto, that keeps extension agents from extending their services to small private farmers. That they do not, however, is partly the result of the poor supervision of field staff and the ineffective organization of extension delivery.

Since there is no fixed schedule of visits by extension agents to farmers, supervisors cannot verify whether agents are carrying out their tasks properly. Since the 1975 agrarian reform, ARDU extension has abandoned individual farm visits. Farmers receive messages by observing the farm of a peasant association, service cooperative, or producer cooperative. Demonstrations of fertilizer and crop varieties are conducted at the rural development centers. Even so, 21 percent of the farmers interviewed indicated that they had never seen an extension agent on a group visit, and 33 percent reported that they had last seen an extension agent between two and ten years previously.

To the above-mentioned problems should be added the lack of any system of regular meetings in which the RDAs can discuss emerging field-level problems; the absence of regular in-service training for RDAs; the lack of procedures for relaying information on problems faced by farmers to the research department and the general lack of coordination with research; and the absence of an adequate number of well-trained and experienced subject matter specialists to serve as a referral and support system.

The extension services in other regions of Ethiopia have considerably fewer resources. Each of the specialized departments of the Ministry of Agriculture (Water and Soil Conservation, Livestock, Plant Husbandry, Agronomy, and Cooperative Development) runs its own extension service that reaches down to the subdistrict level. Contact between extension agents and farmers in other regions is even more limited than in Arssi, where the ratio of extension agents to rural households is roughly 1:1,900. In some areas which are fairly similar in potential to Arssi, for example, the ratio is 1:6,000.

The T&V System in Ethiopia

The T&V system was introduced in June 1983 in a pilot project in the Tiyo and Hetosa subdistricts of Arssi region and the Ada and Lume subdistricts of Shoa region. It has now expanded into a third pilot project in the Shashemene and Arssi-Negelle subdistricts in the southern part of Shoa. Some eighty front-line extension staff are involved in this experiment.

The T&V system is characterized by a systematic time-bound program of staff training and farm visits. Discipline, a concentration of efforts on agricultural problems, a single line of command, and deliberate linkages with researchers, all assist in improving the effectiveness of extension services. The T&V pilot project is based on the assumption that the effective communication of relevant messages is crucial to the adoption of a new technology. It has three key features in its design (Benor, Harrison, and Baxter 1984; Benor and Baxter 1984).

The first one is a regular schedule of visits by the extension agent, involving person-to-person contact with farmers, so that production recommendations can be communicated effectively. Under the pilot design, a development agent spends eight days of each fortnight visiting farmers of eight different groups within his circle, giving advice on crops, livestock, and soil conserva-

tion. On average, an agent has to visit about 800 farm families, but the number depends on settlement patterns, population density, the agent's mobility, and the intensity of cultivation in the area. The agent covers three or four peasant associations, in each of which are two or three farmers' groups. An agricultural extension officer (AEO) visits the agents within his range at least once a fortnight. The subject matter specialist (SMS) makes frequent field visits to provide technical support to agents and AEOs. The awraja (or district) extension officer (AAEO) is responsible for the effective working of the system and exercises administrative, financial, and technical control over the entire extension staff in his district. He also gives guidance and supervision to agents, AEOs, and SMSs by making at least three days of field visits each week. A single line of technical and administrative command in the pilot project provides the necessary backup and supervision to agents by AEOs, SMSs, and AAEOs.

The second key component of the T&V pilot is the regular training of extension agents to upgrade their skills. The pilot features two training days for development agents and AEOs each month. In the first session the SMSs teach the specific production recommendations to be disseminated over the next four weeks. Farmers' reactions to previous recommendations are also discussed and then passed on to research staff. Two weeks later the development agents have a review session with the AEO.

The third key feature of the T&V pilot is its attempt to link extension and research. Researchers work to upgrade the skills of the SMSs in a monthly workshop at which both parties discuss the production recommendations that will be disseminated to farmers by development agents and AEOs during the next month. Extension needs up-to-date research findings in order to demonstrate relevant technologies to farmers, while research requires extension guidance in order to focus on the farm-level problems facing farmers. This two-way information flow between extension and research has been difficult to attain in Ethiopia since the two functions are administered by two separate agencies, the Ministry of Agriculture and the Institute of Agricultural Research—with the institute resisting any effort toward formal integration or cooperation with the Ministry of Agriculture. The T&V system in both pilot project districts has tried to bridge this gap by creating the position of research-extension coordinator in each of the three pilot areas to work on SMS training, joint on-farm trials, field visits, and other activities related to both research and extension. In addition, a Research-Extension Liaison Committee has been formed in each pilot area to approve action plans for extension before the main cropping season and again before the dry season, as well as to approve the program of joint on-farm verification trials.

The organizational structure of the T&V system in Ethiopia is similar to that in other countries, except for the chain of command above the district level. The AAEO sends reports on extension in his district directly to the head of the T&V pilot project unit in Addis Ababa, who has the overall responsibility for the T&V system. He makes most of the decisions required at headquarters and brings issues of major concern to the T&V Pilot Project Committee, which is chaired by the head of the Department of Peasant Organization and Agricultural Development. In this way, the normal regional structure for agriculture is bypassed and the extension chain of command is clarified.

A Comparison of T&V and ARDU Extension

The T&V extension system was evaluated on the basis of in-depth interviews with randomly selected contact farmers. This is not a large sample survey, and the findings should be taken with caution. The results of this evaluation are compared below with the responses of farmers who were served by ARDU extension.

- All the T&V contact farmers knew the name of their agent and the day of his visit. They indicated that he always came every two weeks. Under ARDU extension there was no fixed schedule of visits to farmers in a peasant association or service cooperative. As a result, one-fifth of the sampled farmers had never seen an extension agent. Among the sampled ARDU farmers in Arssi, the only one who had seen an agent every two weeks was a contact farmer under the T&V system.
- Selected farmers under the T&V system and ARDU extension were asked if they remembered the message taught by the extension agent on his last visit. Most of the farmers who remembered the messages delivered by ARDU extension had seen an extension agent in the previous six months. The majority of those who had forgotten the message had not seen an extension agent for five to ten years.
- Almost all the T&V contact farmers interviewed said that the recommendations they learned from their agent were relevant. They had made some changes in farming practices and were also unanimous in placing high confidence in their agents. Under ARDU extension, however, only 52 percent of the sampled farmers had confidence in their extension agents.
- Since the agents are the key to the effective func-

tioning of the T&V system, they were asked about their activities and their experience. Almost all stated that under the T&V system they extended more specific scientific information to farmers, worked more closely with farmers, and understood farmers' problems better. They also said that constant interaction with AEOs, SMSs, and AAEOs had improved their technical competence in various fields.

- The proposed linkage between extension and research under the T&V system was not fully implemented in the pilot project areas. This was due to the internal politics of Ethiopia and does not reflect any weakness in the T&V system itself. No research-extension coordinator was appointed in either of the first two pilot project areas during the time of the evaluation, so contact between SMSs and research staff was limited. The third pilot project area did have a coordinator, however, and this linkage was reported to be working well—mainly because the concept had the strong support of the director of the Awasa Research Station. In all areas SMSs undertook trials and held informal discussions with researchers, and individual researchers proved highly supportive. Research-Extension Liaison Committee meetings at the local level were reported to be useful, although they took place less frequently than envisioned under the pilot project. If these initial contacts are solidified, a two-way flow of information from farmers to researchers by way of development agents should occur, as envisioned in the T&V system. Under ARDU extension, however, there is very limited coordinated linkage between extension and research. There is only a one-way flow of information: from research department to extension agents and then to farmers. This is likely to be a major reason why farmers reported that ARDU extension does not relate to the most serious problems they face in farming.
- The average yield of wheat among the contact farmers under the T&V pilot in Arssi was 26 quintals per hectare on plots where they had followed the full package of extension recommendations (Ethiopia, Ministry of Agriculture 1984b). Benefit-cost ratios for fertilizer use at the recommended rates, in combination with other recommended practices, were between 2.5:1 and 4:1, even at low government procurement prices—a considerable improvement in efficiency and financial attractiveness. Among farmers covered by ARDU extension yields of wheat averaged 15 quintals per hectare, with benefit-cost ratios for similar levels of fertilizer use accordingly less attractive.

Adapting T&V Extension to Ethiopian Conditions

The T&V system can be adapted to fit the particular ecological, socioeconomic, and administrative conditions of Ethiopia, but, as the designers of the system have emphasized, some of its essential elements should not be altered (Benor and Baxter 1984). These include a unified chain of technical and administrative command, a focus by extension staff on agricultural extension, regular staff training and farmer visits, and the establishment of effective linkages with research. Consequently, for the wider adaptation of T&V in Ethiopia, two fundamental changes in the extension systems of ARDU and the Ministry of Agriculture are essential. First, agricultural extension must be separated from the promotion of cooperatives and political education. These tasks require different skills and manpower, and they should be administered by different departments. The present system of using agents for diverse purposes not only disrupts the integrity of the line of extension command, but also burdens extension agents with so many nonagricultural activities that the linkage between extension and research is undermined. The second change needed is the coordination of extension and research activities in Ethiopia. The problems faced by farmers need to be passed on to researchers for further investigation, and an extension service cannot be effective without the technical content that comes from research. At present, both extension agents and researchers have limited experience in the field.

If these important organizational issues are addressed, the classic T&V system can be adapted to the manpower and resource requirements of many regions in Ethiopia. Some specific features of a T&V system that can be widely replicated are outlined below.

In order to ensure that the T&V system reaches farmers at the village level, the lowest organizational link should be the service cooperative, a relatively new phenomenon in Ethiopian rural areas. Three to five peasant associations join to form a service cooperative, which supplies members with consumer goods and credit and undertakes self-help activities such as building roads and clinics. In Arssi most service cooperatives are involved in the distribution of agricultural inputs and in marketing output to the Agricultural Marketing Corporation.

At present, an extension agent in Arssi is expected to cover up to ten peasant associations and does not have

time to serve individual farmers. At least one extension agent should therefore be assigned to each service cooperative so that the agents can provide proper service to the peasant associations under each cooperative. The cooperative should also pay part of the salary of the extension agent. This would make him more a representative of the community than of the government and would also make him more accountable to the farmers.

For contact farmers to be effective in spreading agricultural innovations to other farmers, it will be necessary to upgrade their skills through short-term training. The preliminary evaluation of the T&V system in Ethiopia revealed that contact farmers can spread simple messages, but are not so capable of remembering and teaching complex lessons, especially those requiring demonstration. This problem was also found in an evaluation of the T&V extension in India (Feder and Slade 1986). The Agarfa Multipurpose Peasant Training Center could be an ideal place to teach contact farmers agricultural skills. This center operates in the Bale region and offers six-month vocational courses, including agriculture. A large number of the participants are from producer cooperatives, however, and changes would have to be made to accommodate more small farmers, who hold 94 percent of the country's cultivable land.

For the time being researchers should be involved in training development agents directly whenever possible. In the classic T&V approach researchers provide the necessary information on production recommendations to the SMSs in a monthly workshop; SMSs then transfer this information to agents in fortnightly training sessions. This would be difficult to implement in Ethiopia, where most SMSs are inexperienced young graduates of junior agricultural colleges. Moreover, there are no specialists (in the true sense) working at the subdistrict level. In the Shashemene and Arssi-Negelle T&V pilot project area adjustments were made to account for this deficiency: researchers directly train agents at the first fortnightly session in the month, and SMSs reinforce and consolidate the agents' training at the second fortnightly session. Efforts should be made to give most of the young SMSs short-term training locally, and overseas training in specific areas of their specialization, to upgrade their competence in as short a time as possible.

Other problems in implementing the T&V system in Ethiopia can arise from the politics of a particular region. For example, in Arssi the Committee Organizing the Workers' Party of Ethiopia (COWPE) made a concerted effort to block the implementation of T&V extension. The reason given by COWPE was that by providing services to individual farmers, T&V extension would be neglecting the producer cooperatives. An investigating committee was established but soon disbanded when it was seen that T&V extension did not reduce the services to producer cooperatives, but indeed improved them. In the Shashemene and Arssi-Negelle area, however, the problem was the exact opposite: the farmers' groups formed under T&V were suspected of being a ruse to organize farmers into producer cooperatives. Hence farmers avoided meeting extension agents or contact farmers in their villages until COWPE intervened to assure them that this was not a government plot to force them to collectivize! These experiences suggest that, for the most part, extension agents should concentrate on their professional duties and avoid being caught up in local political debate. One way of minimizing the involvement of extension staff in such situations is by separating the tasks of agricultural extension and the promotion of cooperatives. Asian experience, particularly that of India, suggests that this separation would serve both objectives well by minimizing the conflict of interest that invariably arises if both tasks are under the same department.

Recommendations

The majority of the smallholders in Ethiopia are subsistence farmers and totally dependent on rain. Out of a total of 102 districts, 31 have large areas of relatively fertile land and reasonably stable weather conditions. These high-potential districts also contain the majority of the country's peasant associations, service cooperatives, and producer cooperatives. They account for 94 percent of the grain procured by the Agricultural Marketing Corporation, and they consume 95 percent of the fertilizer delivered to small farmers. The research network is also at its most developed in these 31 districts, and it is here that the T&V approach can prove to be cost-effective.

Farmers in these districts have all-weather rural roads that make it much easier for extension agents to make regular farm visits. Most of the farmers are self-supporting and either have used fertilizer or are aware of its usefulness in improving their output. The effective transfer of agricultural innovations to these farmers through T&V extension has the potential for engineering a dramatic increase in yields. The decline in agricultural production in Ethiopia can be reversed by appropriate policies to stimulate growth and to provide farmer incentives in these regions, and a key policy variable is the extension approach used.

Experience with the T&V pilot project in the regions

endowed with relatively better resources shows the superior performance of the system in comparison with the other extension approaches used in Ethiopia. This opinion is shared by high-level officials who supervise the T&V system, by field agents, and by participating farmers. It is important, however, to avoid making unfair claims for the training and visit system. It will not be a viable system in resource-poor and drought-prone regions, nor could it be a panacea for declining food production. It is, rather, a system that has the potential to improve the productivity, efficiency, and effectiveness of the country's extension services, provided the other components of an agricultural development package—such as adequate marketing arrangements, security of tenure, and access to credit—are made available.

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7

Proposals for a New Approach to Extension Services in Africa

Guy Belloncle

It is widely acknowledged today that African agriculture is in crisis. Export crop production is at a standstill or contracting nearly everywhere, and food crop production is insufficient to feed the rural population properly, much less to supply the swelling cities. But who is to be blamed for this situation? Is it that rural people are incapable of change and resistant to any innovation? Or should we rather point to the rural development projects themselves, the objectives they set and the methods they follow?

I have no doubt that the fundamental causes of the present stagnation of African agriculture lie in the projects, as I will try to show. After twenty years of contact with African farmers, I am convinced that they would be quite willing and technically able to carry out the revolution that is required in agriculture, provided they are seen in a different light and finally taken for what they are: not children who must be constantly pressured to change their ways, but responsible adults with a wealth of their own experience, who ask only that the new cultivation methods suggested to them be demonstrably appropriate.

A Critique of Present Approaches

I believe that agricultural extension as practiced today nearly everywhere in black Africa is totally misguided and is a major reason for the crisis in agriculture. Extension services are predicated entirely on an implicit philosophy that leads to a series of erroneous assumptions; as a result, these services rub traditional African societies the wrong way. That they are rejected is incomprehensible to those who judge by external criteria, but is fully understandable to those who are aware of the underlying social logic of this rejection. I shall therefore describe some of these erroneous assumptions and examine their effect on the populations involved.

First Erroneous Assumption: The Need for Close Supervision

"Close supervision" is a basic postulate of all rural development projects in Africa. A substantial share of the funds requested from external sources of financing goes to pay for this. Moreover, when there is a failure, "deficient supervision" is often blamed and a higher ratio of field staff to farmers is commonly called for. But what do we find when we look at the situation objectively? First of all, the technical competence of field staff, who are supposed to be advisers, is often limited—and in the great majority of cases is inferior to that of the technologically more advanced farmers. In fact, these specialists are generally recruited from the group known as "school failures" and are given only a superficial type of technical training—a set of precepts or a "catechism" rather than a scientific understanding of agriculture. As soon as the first farmers have accepted the basic technical recommendations, the extensionist shifts into neutral and goes no further. The farmers soon know his speech by heart even if they do not respond to it for the reasons analyzed below, and he is often held up to ridicule. Very soon, this individual is used less and less to provide extension services and more and more to manage the supply of factors of production, credit, and marketing services. Again, this has disastrous consequences.

On the one hand, the presence of an extensionist who does all the management work aggravates the problem of making farmers responsible for tasks that they are

fully capable of assuming. On the other hand, when the extensionist is required to recover loans, he is almost always seen as an "agent of repression," and this fatally compromises the educational role that he should play. (As the Hausa proverb warns, "You shouldn't have a stick in your hand when you call your dog.") Most important, these agents are young (farmers often call them "the children"), and management tasks—especially the handling of money, whether in granting credit or in marketing—offer temptations to which they regrettably often succumb. Furthermore, as representatives of development projects in the field they are responsible for implementing all decisions, including the most unpopular ones, without being able to explain them. In view of all these factors, one can readily understand the sometimes brutal rejection of extension agents in many countries.

In any case, the employment of such agents is both ineffective and expensive: ineffective because all the tasks that extension agents are now given could be done better by organized farmers; expensive because although their unit cost may be low, their number is so great that their total cost often represents a large share of a project's budget. One may ask whether these funds would not have a greater impact on agricultural production if they were used to reduce, directly or indirectly, the cost of inputs.

Above all—and this is the key factor—close supervision implies that the farmer is incapable of adopting the proposed changes on his own and that constant pressure must be kept on him by these young agents, who are very quickly regarded more as watchmen than as advisers. This constant inspection betrays a lack of confidence in farmers' ability to adopt, by themselves, innovations that would be beneficial for them. This continuing absence of a true dialogue between adults is a condition that farmers are finding less and less acceptable.

Thus, unlike many other people, I do not see the need for strengthening supervision in extension—but rather for *decreasing* it to permit farmers to take on their responsibilities as they should. The assumption that close supervision is essential has so far kept farmers from doing this. What is needed is a smaller number of agents of higher caliber—not only in technical matters, but also in human relations—who can engage in a totally different relationship with farmers, as I shall propose below.

Second Erroneous Assumption: The Need for Pilot Farmers

The use of pilot farmers is common among extension services in various projects, and it is the characteristic that most profoundly contradicts the values of traditional African society. As the anthropologist René Bureau (1978) writes, traditional society operates as a "machine for beheading unscrupulous climbers"; its "ultimate purpose is to guard against inequalities and to tirelessly strengthen harmony, which is under constant threat." The identification of pilot farmers and the specific support they are given can therefore be perceived by villagers only as a profound injustice, as a wish to benefit certain individuals to the detriment of the community as a whole. Communities expect *collective progress,* because it corresponds to deeply held values. This does not mean starting with everyone at the same time; there will always be those who start first. But, as I shall show, this can be done with the consensus of the group and not, as often happens now, with conflicts that may have serious consequences. (Frequently, for example, individual innovators leave their village and resettle some distance away to avoid the pressures to which they are subjected.) I consider it essential to do away entirely with the individualistic view that lies behind the theory of pilot farmers. Instead, a community teaching program would be more consistent with the way traditional African societies view their world.

Third Erroneous Assumption: The Need to Compartmentalize or Fragment Technical Recommendations

Agricultural development projects everywhere categorize the practices recommended by agronomic research as either simple or complex; and the latter are not considered in extension work until the former have been adopted. Again, this approach has disastrous effects and can lead to terrible misunderstandings between farmers and extension agents. The "simple" practices are in many cases too simple to offer even the beginning of a solution to the acute problems facing agriculture in Africa.

To illustrate this point, I cite a personal experience in 1968 near Magaria in eastern Niger. I heard the extension agent recite over and over again his catechism about the treatment of seeds with fungicide, row planting, economic applications of fertilizer, and so on. Finally a farmer interrupted, saying something like this: "Everything you are saying here we know by heart and have tried. But when the land is dead your poison [fungicide] and even your powder [fertilizer] do nothing. A white man came to our village three years ago and asked for a field. We gave him the most worn-out of fields, behind the village. The white man surrounded it with his barbed-wire fence, and a young helper came with oxen and equipment and cultivated the field as he

was told to do. Today, where we harvest not more than 20 sheaves of millet, that field produces 100. If you know the secret of that field, tell us. If you don't, stop bothering us."

That field was, of course, a research plot where fertility was being restored by applying natural phosphates, plowing under crop residues, and fertilizing with manure. And that is what the farmers of Magaria wanted to learn. Unfortunately, when a project was prepared two years later, it was devoted to simple practices taught with close supervision, but with no provision whatever made for restoring fertility by applying natural phosphates, even though these were available in the country.

It may seem paradoxical, but if African farmers as a whole have not yet adopted the practices recommended to them, the reason is not that they are too complicated; on the contrary, they are too simple to solve farmers' problems, particularly the continuous decline in soil fertility resulting from the disappearance of long-term fallowing, the traditional method of soil regeneration. This situation leads to a tragic misunderstanding: on the one hand, the farmers reject even the simplest recommendations after years of unproductive tests; on the other hand, the agents do not propose any more complicated practices to them, on the grounds that they have not yet adopted the more simple ones. Here again, a new approach is needed. Extension agents should discuss a complete modernization strategy with the farmers and should show how different techniques reinforce one another and can ultimately provide a solution to their problems.

Once again, are not the pedagogical arguments used to justify the compartmentalization and fragmentation of recommended practices based on a lack of confidence in farmers' ability to understand the strategy as a whole? In any case, a fragmented approach means treating farmers as children, and as I have said, they soon react by deriding the extension agent's catechism. What is needed, to repeat, is a change of attitude and an appreciation of the farmers for what they are: responsible adults who want to know where they are being taken before setting out on the journey.

Fourth Erroneous Assumption: The Existence of the Model Farm

Most project documents contain the concept of the "model," or average, farm—one with, let us say, three workers, a pair of oxen, and six hectares. But one need not spend much time in the villages to realize that this notion is by no means realistic. In fact, agrarian structures in Africa are infinitely complex. Almost nowhere does the farm consist of a plot worked continuously by a single tenant, as suggested by the European idea of a farm.

Fields in Africa are instead dispersed and worked by different people who put them to different uses. Some regions still have fields owned by the extended family which are worked in common and devoted primarily to food crops, as well as the fields of nuclear families devoted mainly to commercial crops, and women's and young people's fields cultivated on certain days of the week. This is a far cry from having a single head of the farm making all the production decisions. And what can be said about the number of workers (which can be anywhere from one to fifty), the extent of mechanization, and the areas worked? Obviously, it is impossible to consider uniform strategies of modernization for all these cases. Here again, only through patient dialogue with those concerned can strategies be adapted for each case.

Fifth Erroneous Assumption: The Representativeness of Adult Males

Projects are commonly targeted solely at the adult male population, yet no one can deny the importance of women and young people in agricultural production. In nearly all African societies women take an active part in agricultural work, and what anthropologists call a "sexual division of labor" cannot be ignored. In many societies women spend a certain number of days each week working fields that are directly assigned to them, the produce of which belongs to them. In some regions, certain crops are grown entirely by women; this is particularly true of traditional rice growing in West Africa. Projects have come to nothing because they failed to take this basic fact into consideration. Moreover, young people make up the bulk of the labor force and are therefore also directly concerned with the technical innovations that are proposed.

Instead of benefiting from agricultural gains, these two groups are victims because they most often bear the added work load while the incremental income remains under the sole control of the family head. In many projects, having failed to perceive this process, planners are confronted with an impasse that they cannot explain. The new model of extension services should therefore take heed of social groups as a whole.

These, then, are some of the erroneous assumptions that underlie the current philosophy of agricultural extension services in Africa and that go a long way toward explaining the meager results achieved. It is time to look at another possible model of extension services—one that pays greater respect to African farmers and to

the fundamental values of the societies in which they live.

A New Approach to Extension Services

The principal assumption underlying this new model of extension services is that African farmers, far from being locked into the use of out-of-date techniques and resistant to any innovation, are indeed aware that they must alter their traditional farming practices. They are therefore prepared to learn new ones provided that they understand what is involved. There is no shortage of examples showing that when innovations are technically feasible, sociologically acceptable, and economically profitable African farmers will quickly adopt them. Farmers cannot continue to be blamed for things that are not their fault. Extension approaches must be changed and a true dialogue held—not with individuals selected by outsiders, but with existing communities—to propose a type of rural development that will ensure the survival of the group without leaving anyone behind.

The group instruction should take place in three stages, which I will call self-analysis, self-programming, and self-evaluation. Each of these stages will be discussed in turn.

Self-Analysis

These days, nearly all rural development projects are prepared from outside without any consultation with those who are assumed to be the beneficiaries—the farmers. Consideration is given to the role of the local community, but none to how the farmers themselves analyze their agricultural situation or to their ideas on how to improve it. This situation can be remedied by listening to the people concerned and allowing them to state how they see things. The simplest way to do this is through open discussion of the traditional kind. Everyone who has taken part in such meetings has been struck by the extraordinary ability of farmers as a group to analyze their situation, by the remarkable clarity of their thought, and by their expectations compared with those of outside specialists.

As an example, I will briefly recount an experience in Mali, in the village of Suransan-Tumunto north of Kita. During the advanced training of literate young farmers, we wanted to help the villagers make a systematic analysis of some of their farming problems and find possible solutions. There followed seven evenings of self-analysis, which revealed some fundamental lessons (see Belloncle 1979).

The farmers saw with extraordinary clarity the main problem facing the village: the constant decline in soil fertility because of the continuing reduction of the fallow period. They were able to express not only the reasons for it (population pressure, the place given to groundnuts, the transition to animal traction) but also their feeling of powerlessness in the face of a process that seemed to be irreversible. One possible solution they mentioned was to make livestock more sedentary; this had been done to some extent, but the problem of watering the stock (not of grazing) remained. How, they asked, could penned animals be watered during the dry season, when people themselves lacked easy access to water? Another major concern was that their fields were overrun by striga, considered by the farmers of Suransan to be the main cause of the fall in millet and sorghum yields. What could their extension agent propose to meet these two critical and entirely justified concerns? The catechism, I fear, was still fungicide, row planting, and the economic application of fertilizer. How then could the farmers be interested in extension?

Undoubtedly it will be objected that an exercise in self-analysis so carefully conducted in one village cannot be generalized to all villages involved in a project. However, when a project is being prepared (or a new project is being negotiated), it is not necessary to carry out this process in every village. At this stage it is sufficient to conduct self-analyses in a representative sample of the villages, in order to obtain a reasonably accurate idea of what problems villagers are concerned with, how the communities perceive their situation, and what their expectations are concerning the project. Whatever the number of villages that may be targeted in this phase, one thing is certain: the villagers' views should have at least as much weight in the preparation of the project as the opinions of any outside experts. Thereafter, as project implementation proceeds, self-analysis can be extended gradually to all villages involved. This is an "assisted" self-analysis and not a "spontaneous" one, since it requires an outside facilitator.

The bottleneck here is not the time required, but the ability of extension workers to perform this complex task. Indeed, only competent specialists (happily, their number is growing every day) with appropriate training in sociology and pedagogy (which, sad to say, is still acutely lacking) can do the job well. It is not—and this must be clear—a process that can be started by the present cadre of specialists or agents.

Self-Programming

When the farmers have completed their self-analysis the ball is, as it were, in the court of the technicians. Their task is to point out solutions to the problems

raised—to offer a consistent overall strategy and not, as is usually the case now, a few suggestions of transitory relevance. Although village-by-village discussions and negotiations should be conducted, it is obvious that the whole village cannot adopt the entire proposed strategy at the same time. Self-programming should therefore respond to the following questions: Who is to make the first tests of the new techniques recommended? What will be the consistent sequence of complementary techniques with which they start?

To begin with the first question—who? Under present extension approaches, pilot farmers play the role of experimenters in the hope that their example will have a ripple effect. But because pilot farmers introduce new practices without the prior concurrence of the whole group, they are "odd men out." Therefore, under a new approach I would propose that the village as a whole publicly designate the "agents of innovation." Since this designation (or delegation) would take place after the self-analysis phase described above, the status of these innovators will be totally different from that of pilot farmers. Instead of appearing as odd men out (or traitors) they will be admired because they agree, by delegation of the group, to run a risk that the group as a whole cannot take.

On the second question—what?—I have deliberately spoken of a "consistent sequence of complementary techniques." In point of fact, seldom does an isolated practice have any significant impact on agriculture. Most frequently it is a combination of several techniques that permits noteworthy gains in productivity. The role of the technicians, then, is to ascertain, in each situation, how the overall strategy that has been discussed in full with the farmers can be broken down into meaningful components for testing by the agents of innovation.

One last point of utmost importance: wherever there are literate farmers, the agents of innovation should be chosen from among them (the villagers usually do so on their own in any case). The ability of an agent of innovation to communicate in writing greatly facilitates the technician's work. It enables him to prepare realistic experimentation programs and to ensure that the recommended practices have been applied rigorously. Moreover, areas and yields can be measured and the cost of inputs and production increments calculated precisely, so that the necessary economic calculations can be made and the exact rate of return on the investment determined. With literate and numerate agents of innovation it becomes possible, in the phase of self-evaluation, to obtain quantitative data and to hold discussions based on concrete information verifiable by all.

Self-Evaluation

Self-evaluation might be defined as the point at which the agents of innovation report on the mission given to them. "Here," they explain, "is what you have asked us to verify; here are the results we have obtained." It is obvious, however, that the other farmers will not have waited until that point to get an initial idea of the value of the new practices recommended. The preceding phases (self-analysis and self-programming) will already have kindled their interest in the demonstration plots. By virtue of the group discussions, they know exactly what those fields were intended to demonstrate (which is not the case when the demonstration plots are worked by extension staff). Thus, they already know from observation whether the proposed innovations are of any value.

What self-evaluation can contribute is precisely the possibility of the measurement or quantification just mentioned. The agent can lay his cards on the table, saying, "Here are the recommended techniques and the results obtained from them; what do you think?" To facilitate the discussion at this point, it is very useful to have a scale model or some other device to show the results visually—so that even illiterate persons can understand. If, as expected, the new techniques prove more effective than the old ones, self-evaluation will allow another question to be asked: what is keeping everyone from adopting these techniques? This will make it possible to go beyond the subjective obstacles ("I didn't adopt the recommended practices because I wasn't convinced of their effectiveness") to reveal the objective obstacles ("I really wanted to adopt these practices but such and such a thing prevented it"). The extension service must be very attentive to such obstacles if it wants to speed up the rate at which innovations are adopted.

This self-evaluation can also apply to the results of practices already adopted by some farmers in the village (one never actually starts from zero). Thus, in a cotton-growing village where some farmers produce more than three tons while others cannot obtain even one ton, the discussion can focus on the reasons for the difference (which as a rule they have thoroughly analyzed), and on what is keeping all the villagers from achieving the same yields. Again, this would highlight obstacles that are more objective than subjective. Moreover, such self-evaluation will lead in turn to new self-programming.

Another example: after a rise in the price of insecticides, the extension service observes a tendency among farmers to reduce the quantity applied and the number of treatments. In a self-evaluation of what has happened, the farmers cite the rise in insecticide prices.

How, then, can they be convinced that despite the higher price, the recommended treatment is still profitable and that they should continue to use four applications of four liters per hectare? Preaching by the extension adviser will obviously be fruitless in such a case. The only course of action is to offer experimental evidence that treatment will remain profitable. The villagers can be advised to designate a number of farmers who will compare results obtained on the same field—with one plot being treated four times with four liters, and another plot of the same size treated three times with three liters. Here again, literacy is important to permit all the economic calculations.

This, then, is the new methodology proposed, with its three phases of self-analysis, self-programming, and self-evaluation. (The first and third can be combined when, as is frequently the case, the village is already involved in a project.) The methodology is based on the conviction that African farmers are responsible adults, are aware that their cultivation practices need to change, and ask only to be convinced that the new techniques recommended to them offer a lasting solution to their problems. The only way of convincing them is to discuss the entire modernization strategy proposed and to give farmers a concrete means of verifying its validity through experimentation. Farmers—in Africa as elsewhere—are, in point of fact, experimenters by nature. For them, seeing is believing, especially seeing things on their own fields. Hence the importance of the farmer-experimenters designated by the group, who act on the group's behalf to test the techniques that all members will later be asked to adopt. Hence also the importance of there being at least some farmers in each village literate and numerate enough to enter the world of measurement and to speak a common language with the outside specialists—a situation that is all too rare (for a rapid method of making a core of farmers literate in each village, see Belloncle 1983). This point will be discussed below in connection with the training of young farmers who, as stated earlier, can play a decisive part in the agricultural revolution that African agriculture must undergo and who have been almost completely neglected until now.

Scientific Agricultural Training for Young People

Although most countries have systems for training farmers, they reach a very small number of young people and have had but little impact in the home villages of the trainees. It is not hard to understand why. When young people are trained away from their own milieu, they are cut off from their villages, and when they return at the end of their training they may appear to be dangerous troublemakers. Often unable to apply the blanket recommendations they have learned at the training centers, the young people become discouraged, sell their equipment, and leave. Once again the need is to change procedures and to train young people in the village and for the village.

One result of the self-analysis phase is that the older people are made aware of the extent of the changes recommended and the time needed to carry them out. Some are bound to feel unable or unwilling to join the revolution to which they are being invited; they may feel it is up to young people and will ask the outside experts to train them. The chances for success in such circumstances are optimal. But how can the training actually be organized?

The first step is for the family heads to agree that all young people of the village (often grouped further by the traditional age strata) will work an experimental tract of land, make consistent tests of all new techniques recommended, and report regularly on the results. The new practices would include the most recent findings of agricultural research, which is increasingly concerned with developing appropriate systems of production and optimal combinations of factors, rather than individual techniques for use in isolation. The ultimate aim would be to make this group of young people responsible for testing the new production systems recommended for each village. They would do so by working a "prototype farm," a forerunner of what the village farms could look like in ten or twenty years.

These prototype, experimental undertakings should also serve an educational purpose. They should provide not only instruction in how to apply the new practices, but also the scientific background that young people need in order to understand the reasons for what they are being asked to do. This scientific training should of course be given in the national language, which may require an extensive prior language program: an experiment conducted in two villages in Mali has shown that it was entirely possible to teach the basic concepts of soil and plant science in local African languages. Having learned these concepts, the young people will be able to understand the scientific reasons for adopting one technique rather than another.

Let me underscore the importance of an intensive program to make young people literate in their native language. Although it is not impossible to provide agricultural training orally (and experience shows that all young people, literate or not, are eager to take part), the ability to use the written word is of great value. The trainees can take notes on the courses that are given and can read written instructions for the tasks they will be carrying out. Furthermore, a core of literate youths

in the village can greatly facilitate the work and can mediate between other young people and the external trainers. Numeracy plays an important role, as we have seen, in measurement—especially of areas, prices of factors of production, quantities harvested, yields, and so on, all of which are essential for accurate economic calculations. Literacy and numeracy must therefore be integrated in the training as quickly as possible, and experience shows that this can be done when young people are strongly motivated.

Apart from this long-term task of preparation for the future, the village youths, especially if they include a core of literate people, can serve as the agents of innovation with respect to the practices recommended for immediate adoption by all villagers. If the extension service has something new to propose, it should therefore address itself to the youths of each village, asking them to compare traditional methods with the recommended innovations in simple trials. Needless to say, all of this should be done after everyone has been consulted and informed, so that each villager is clearly aware of what is happening. Experiments of this type have been conducted in several villages in Mali, each time with great success. To promote such activities more widely, a number of projects would have to be adapted so that they provide young people with scientific training, at least on an experimental basis.

The problem with this approach to extension lies less with the farmers than with the need for specialists who can initiate a process that is both participatory and rigorously experimental. Such a process will be infinitely more effective and will allow a much faster spread of innovation than will the present procedure of providing simple recommendations and close supervision.

Ensuring the Participation of Women

African women play a key role in agricultural production. The changes that have occurred in agriculture, however, have often added to their already burdensome tasks of carrying water and wood, processing crops, and preparing food. This is particularly true in cotton-growing areas, where women do most of the harvesting. Furthermore, in regions where cash income is relatively high, the proportion received by women is generally decreasing. The additional time that women must devote to cash crops (the income from which usually goes entirely to men) is no longer available for traditional activities (crafts, small-scale stockraising, gathering and processing of secondary products) that have in the past provided them with their own income. Sometimes—especially when hydro-agricultural development makes it possible to shift from traditional rice growing to more productive methods—women are in fact dispossessed of their fields. In addition, the deterioration of the environment (deforestation and the decrease in rainfall) makes some of their traditional tasks (gathering wood and pumping water) much more onerous. In sum, it cannot be said that women have always benefited from "modernization" or "development."

For these reasons, it is imperative that they be made partners in solving agricultural problems and that their particular interests be taken into account. The procedure described above, with its three phases of self-analysis, self-programming, and self-evaluation, can be introduced with this in mind. Nonetheless, because of sociological factors it will usually be necessary to obtain the prior agreement of the men before the women can be included. And the women may first have to meet separately to express their own thoughts about their problems before a general meeting is held. Female specialists will be needed to enable true "bargaining" among all social groups (men, women, young people) within the villages, so that the necessary modernization will be everyone's concern and will benefit all. To take only one example, the integration of farming and stockraising, which is essential to the future of the Sahel-Sudanian regions, cannot occur without the active participation of all groups and without a new sharing of tasks and incomes.

To advance the status of women, agricultural development projects must take account of the role of women, not only as wives and mothers, but also as producers (see Belloncle 1980 on the problems of the advancement of women). There is no question that this is a long-term undertaking, all the more urgent because very little has been done. But it is imperative to begin it if the profound transformation that African agriculture requires is to take place successfully.

Conclusions

African agriculture is undergoing a crisis that threatens the very future of the continent. A critical problem in most areas is the continuing degeneration of the soil, as the supply of fallow fields dwindles without the emergence of any compensating new techniques for maintaining fertility. An agricultural revolution is therefore urgently needed, and new systems of production must be adopted. Agronomic research is now in a position to recommend many new farming systems that have already been tested at research stations and support facilities. The question is how to bring about their adoption before the damage becomes irreversible (as has already happened in some regions). The answer lies in adopting packages of techniques which are far more complex

than the recommendations now being disseminated by extension services—packages such as the systematic correction of nutrient deficiencies in soils by the utilization of crop residues, the plowing under of green vegetation, and the use of manure. There are no simple solutions to the problems that African agriculture is facing today, because these problems are inherently complex.

Since the situation is worsening everywhere and at a very rapid rate, I have tried to show how farmers can be motivated to adopt new techniques within a very short time. It is no longer a matter of going from door to door trying to convince a few individual farmers to adopt a few simple techniques. It is necessary to address entire village communities in order to save village lands as a whole while there is still time. Community participation in self-analysis of their situation is required, not to make villagers aware of drastic implications (they are often much more aware than the "experts"), but to help them to act and to accept profound but imperative changes. I have proposed that new practices be tested systematically in the village by agents of innovation. I have tried to point out the essential role of the traditional associations of young people, who should be made responsible for a prototype farm that would also allow the practical application of a truly scientific program of agricultural training.

All of this will often require the introduction of a common language to allow a permanent dialogue between the villagers and the outside specialists. This in turn means that at least a core of farmers (usually the youngest ones) must be literate in the national language. Functional literacy and numeracy—which can be taught in less than three months—will enable the villagers to make the measurements commonly used by technicians and will give them common points of reference for discussions in a language known to all. Furthermore, all groups in society (men, women, young people) must take part in the discussion of how their present conflicts can be overcome—conflicts that are overshadowed by the question of the survival of the village itself.

The strategy proposed here should not be separated from the establishment of farmers' associations to take over responsibility for the management tasks (input supply, the provision of credit, marketing) now handled by specialists. The existence of such associations will allow some community costs (financial, educational, and social) to be borne by the villagers. As has been demonstrated by the village associations established by the Compagnie Malienne de Développement des Textiles (see chapter 8), it is in this context that a new extension strategy has its best chance of success.

If all these conditions are met, African villagers can move decisively toward the agricultural revolution which alone can safeguard their future. I am convinced that they are ready to start upon that path, provided they are approached by specialists who acknowledge them as partners in a continuing dialogue between equals, in which each contributes his own experience. Perhaps the foregoing reflections will convince some specialists to follow this course and will give them the desire to test the procedures proposed.

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8

Village Associations and Agricultural Extension in the Republic of Mali

Boubacar Sada Sy and Mamadou Yero Bah

In February 1964 the government of Mali signed its first agreement with the Compagnie Française pour le Développement des Textiles (CFDT) to develop cotton in the administrative districts of Ségou and Sikasso. Ten years later the CFDT was replaced by a mixed company, the Malian Textile Development Company (Compagnie Malienne de Développement des Textiles, CMDT). This chapter traces twenty years (1964–84) of experience with agricultural extension and, since 1974, the innovative promotion of producer organizations, which in Mali are called village associations.

CFDT/CMDT Experience with Extension

Two methods of extension have been debated in Mali for nearly twenty years. In the first approach pilot farmers are the focal point of extension activities, and their example is expected to have a ripple effect. Because this approach was not tailored to local socioeconomic conditions and underestimated the importance of tradition, it failed wherever it was used in Mali.

In the second approach it is assumed that pilot farmers can and should emerge from extension activities, but they are not recruited in advance. The extension method is based on group dynamics, and technical messages are transmitted through traditional structures (villages) and directed to all farms. This approach seeks to promote the overall development of the community concerned and to tailor agricultural extension activities perfectly at all times to the land and people. This philosophy was adapted by the CMDT and shaped its methods of operation.

Since 1964, the initial year of "Opération Coton," there have been two phases in the development of extension activities.

Phase 1 (1964–74)

The initial steps were taken in an area of 96,000 square kilometers, where there was a very low level of agricultural technology and barely 4 percent of the farmers were equipped with animal traction. In such a situation, an increase in productivity could come only by introducing new farming techniques such as animal traction, the use of chemical or organic fertilizers and improved seed, adherence to a production timetable, and crop protection—or by improving existing techniques such as rotation management. To do this, intensive and competent extension was needed. This posed serious problems because the available extension workers needed training just as much as did the farmers.

Extension began with a study of the local setting; it was thought vital to have a thorough understanding of the milieu in which extension was to be carried out. The study provided knowledge about physical conditions (different types of soil and trace elements), customs (working days and holidays), social and religious organizations, family and farm structures, economic activities, and the like. From this information, three situations which an extension agent could face when disseminating production information were identified: first, when a new technique was totally unknown to the farmers; second, when a technique was known but not used; and third, when a technique was known but improperly used. A methodology for each of these situations was devised and used as the basis for extension activities.

Case 1. New technique. An entirely new technique introduced into a rural setting should be described as an innovation—for example, the use of ultra-low volume (ULV) sprays in an area where the technique, the equipment, and its operation are totally unknown. Farmers will accept an innovation only if they feel they need it. Thus the first task of the extension agent is to make them aware of that need. At this stage extension should be tailored to the particular situation of the village or the farmers involved.

In the example of ULV treatment, the extension agent would inform farmers of the new insecticide treatment and describe the technique, propose a demonstration at the farm of a volunteer, and then train one or more farmers in the use of the new equipment and leave them to think about it and discuss it with their families.

Each new technique brings with it a series of constraints—social, economic, or technical. A new technique can upset the entire traditional organization of the farmer's work, for example, or strain the family budget. It may also require the farmer to seek training, which can be a more serious constraint than would appear. It is therefore up to the head of the household to decide whether the change is beneficial.

Case 2. Technique known but not used. The most dramatic experience with an unused technology involved weeding with tiller combines, or multiculteurs. The extension agents had sold a number of tiller combines to farmers in 1968, but the following year were surprised to find little weeding being done by machine. During village meetings the farmers revealed that they knew the machines could do weeding but did not know how to use them. The extension agents had been working in the area for some time, had gained the confidence of the farmers, and had managed to sell several tiller combines—but their efforts had stopped there.

Under such conditions the obvious solution is to stop merely encouraging the farmers and begin to teach them. The message that the extension agent needs to communicate is simply the detailed sequence of steps required to maintain and use the equipment and to evaluate its impact.

Case 3. Technique known but improperly used. The plow is a striking example of a technology that is often improperly used. Frequently the runner is completely worn out because the regulator is not adjusted correctly or the chain is too short. There may not even be a regulator, or the control to adjust for depth may be missing. If a plow is kept in service beyond its useful life, it does not do the job properly, and there is abnormal wear on the equipment and the team.

In such a case, the extension agent might find himself in an awkward position because this problem is most often the result of demonstrations that were poorly done or not done at all. An agent who is an expert in plowing should organize demonstrations with a properly adjusted plow in good repair. This can be guided with only one hand, to demonstrate that a plow in good working condition is less tiring for both the farmer and the team, that wear on the working parts of the plow is even, and that the plowing can be done well and uniformly.

In this first phase of extension activities, the framework for an efficient system was put in place and it was possible to show the benefits that could be reaped. At the end of this period about 32 percent of the farmers had machinery, as against 4 percent in 1964, and productivity had risen considerably, especially for cotton, because of the effective utilization of the techniques disseminated. At the same time, other activities were initiated that made the operation a truly integrated rural development project from 1974 on. These included the training of traditional blacksmiths in response to the increased use of animal traction, the training of young farmers at seasonal centers, the delineation of fields, and the improvement of stockraising methods, especially by the introduction of forage crops. It was shown that the widespread use of animal traction and of simple techniques within the reach of everyone could speed up the modernization process in the countryside.

Phase 2 (1974–84)

During the second phase the CMDT was established, but extension objectives remained the same: more intensive use of technology and the promotion of village associations. The strategy was to strengthen basic extension activities for farmers at a low technical level, while tapering off extension services to the more technically advanced and better equipped farmers, and to help village groups find solutions to managerial and organizational problems. This involved raising the level of technical and managerial expertise in the extension services to cope with the complexity of emerging needs.

More intensive use of technology. Technical achievements eloquently reflect the efforts made from 1974 to 1984: the number of villages served rose from 2,370 to 3,288, while the number of farms monitored rose from 68,600 to 104,000. (The number of extension agents, however, increased only modestly—474 in 1974 and 554 in 1984.) By 1984 cotton was grown on 113,000 hectares, up from 69,500 hectares, and average cotton yields increased from 720 kilograms to 1,112 kilograms

per hectare. The area planted with millet and sorghum served by agricultural extension rose from 20,700 hectares to 135,000. The area under maize, a mere 4,000 hectares in 1974, totaled 38,000 hectares in 1984 with yields often of more than 3 tons per hectare.

Promotion of village associations. During the same period, the CMDT was promoting the growth of village associations to take over responsibility for a number of services previously provided by the technical extension service. The goal was to interest farmers in managerial duties by giving them access to a supply of inputs, agricultural credit, and marketing services. Transferring certain tasks to the farmers then freed the extension apparatus to concentrate on giving advice on livestock, water supply, literacy, human health, and so on.

Farmers organize into associations for psychological, economic, and social reasons. Associations promote progress and foster greater awareness of the problems that can be overcome collectively but not individually. When farmers take over the management of credit and marketing, relations between them and the extension agent are generally strengthened in consequence—the agent no longer finds himself in an adversarial relationship with certain individuals. As the sole entity authorized to grant credit, the association makes its own decision about loans to its members. Economic benefits include joint income from marketing surpluses, remuneration for the work of the village purchasing team, the production from communal fields worked by the young on a voluntary basis, any dues voted by the group, and interest from the loans made to members of the association. This income is used to make investments (in scales, wells, mills, storehouses, maternity clinics, and literacy centers) of general interest to the group. The farmers also set up a mutual aid and credit system for the poorest among them.

In addition to these benefits, there are obligations of which the farmers are fully aware. First, it is necessary to comply with the rules adopted by the group, to share responsibility, and to try to enlist the hesitant minorities so as to obtain unanimity. Farmers also have to organize and attend literacy programs so that everyone will have the skills needed to participate in the organization and management of the association. The chief external constraint is the need for a well-structured and competent extension service to act as a link between the villages and the outside world.

Controlled growth. Throughout the various stages in the establishment of village associations, extreme care was taken to increase their number gradually and to provide monitoring and evaluation mechanisms. In 1975–76, 38 village associations were established. At the time, management records were kept in French by primary school graduates or by people who had received army training. In April 1977 members of the village associations were allowed to attend a seminar organized in Sikasso for administrative officials and the various state bodies. In 1976–77, 76 new associations had been established. In the following year almost 120 new associations were formed, but end-of-season evaluations revealed an acute problem: the associations were not able to prepare proper accounting documents in French.

The CMDT then decided to concentrate on functional literacy in the Bambara language, and it recruited literacy specialists who had been working at the National Department of Literacy and Applied Linguistics (DNAFLA). In March 1979 the CMDT (with the support of a DNAFLA teaching team) finalized an accounting plan in Bambara and a method for preparing the accounts of the village associations. Accounting in Bambara was widely used after June 1979. Since that time, general village meetings have been held in October to close the books, render accounts, and draw up provisional budgets.

In April 1980 a seminar held in Ségou for extension agents and trainers defined the village association as a development enterprise with multiple functions: commercial, social, and educational. That same year, the training of village health teams was proposed to the associations. The first village pharmacies were opened, and refresher training for midwives began in conjunction with the construction of the first delivery rooms. The village associations were becoming the ideal vehicle for all activities planned within the framework of integrated rural development. Tick control crews and the first small veterinary pharmacies were set up for livestock, and forage crops were introduced. A maize project introduced new means of grain processing that included threshers and mills.

In 1980 the rate at which new associations were established began to slow down. Demand from the villages was still very high, but attention turned to illiterate communities. The formation of a core of literates became the prerequisite for the establishment of all new associations. Concurrently, the older associations had to be strengthened. Some had lost their most able and literate members, and their record keeping was less than satisfactory. Evening literacy classes given over several months had done as much as they could, but the results were poor. A person usually had to attend two literacy campaigns to become literate, and dropouts were frequent.

The CMDT therefore began to develop an intensive literacy training method. Classes were held during the day for several days at a time; participants made sub-

stantial progress. An evaluation seminar in April 1982 studied the possibility of short-term intensive literacy training in 45-day cycles for total illiterates. The new strategy proved highly efficient, and 70 percent of the students became competent enough to keep the management records of an association. Once back in their villages the new literates started learning centers, which rapidly increased literacy—especially among twenty- to thirty-year-olds. It thus became possible to start establishing village associations again. During the 1984–85 crop year alone, 142 were formed, bringing the total number of associations to 674.

Continuous evaluation. Ten years of progress and adjustment show that it should never be assumed that a village association can function by itself. Support and training for the villages should be an ongoing process that adapts to the real situation of each association. In this regard, an evaluation grid was developed to show at all times exactly what the associations are doing and to identify where they have gone astray. The grid is used to evaluate technical functions such as the supply of inputs and credit and marketing activities, as well as the degree of literacy, managerial expertise, the extent of investments, office efficiency, and grass-roots participation. Used annually, the grid can pinpoint weaknesses requiring outside assistance before it is too late.

Village Associations

In addition to the economic and social benefits, the establishment of associations had extremely important consequences for the organization of extension activities. First was the transfer to the village associations of basic technical duties previously performed by the extension agents. Thanks to the intensive literacy training, many villages produced far more new literates than they needed for day-to-day management. Other uses for the new skills therefore had to be found. One of the CMDT's solutions was to form technical teams composed of the more advanced members of the village, who were made responsible for some of the extension tasks. They helped with data-related tasks, for example, by staking out fields; figuring the percentage of the area plowed, sown, and treated; counting cotton bolls to estimate harvests; and so on. They also organized multilocation tests with agricultural researchers, in accordance with directions written in Bambara, and set up demonstration plots, the results of which were circulated to all members of the association.

The second change that accompanied the growth of village associations was a shift toward a more individualized extension service. The CFDT and CMDT had been delivering relatively undifferentiated messages that were directed to all farmers. It became clear, however, that notice had to be taken of the significant differences in the size, number of workers, equipment, and technical level of farms. To implement a more sophisticated approach two major obstacles had to be overcome: a lack of detailed knowledge about farm conditions, and the low level of technical skills among the village-level extension workers. The new literates in the village associations have helped to change the situation radically. In several pilot villages, they have been asked to keep farm records and collect data for diagnostic studies. Eventually it is hoped to form managing committees composed of different categories of farmers.

After several years of work in pilot villages, the Division for Research on Rural Production Systems at the Institute of Rural Economics in Mali has developed a farm classification system, a diagnostic methodology, and related technical proposals. After the factors of production are analyzed for each of a number of types of farm, a production system can be devised so that grain and monetary needs are met; labor, draft animals, and farm equipment are put to optimal use; and soil fertility is protected. A novel feature of this experiment is that concrete cooperation is established between a team of researchers who are specialists in agrarian systems and field extension staff who tackle the daily challenges of a rapidly changing rural scene.

The third change is that the village associations provide an ideal framework for a continuous dialogue between farmers and technicians. Even before the associations were established, the CMDT had started a dialogue with farmers on the problems raised by the transmission of new techniques. Its great concern was to standardize yields of both cotton and food crops. In a given village, farmers may have seemingly inexplicable differences in their yields. The approach now taken by the extension service is to have all members of an association analyze the reasons (objective or subjective) for such differences, so that ways can be found to standardize production techniques. It is also hoped that by making loans to farmers for purchasing equipment, the associations will facilitate the shift from manual farming to animal traction.

Conclusion

The emergence of village associations in southern Mali was made possible by the ongoing dialogue with villag-

ers and by the constant concern of the CMDT to respect the wishes of farmers. The next stage will be to establish rural development zones that will group several village associations under the general supervision of one extension agent. The ultimate goal is to move gradually toward federated groups that will themselves organize the rural development process and handle all the functions previously carried out by the CMDT.

Adapted from a paper presented at the seminar on Agricultural Extension and Its Link with Research in Rural Development, Yamoussoukro, Côte d'Ivoire, February 17–23, 1985.

9

On-Farm Research with a Farming Systems Perspective

Michael Collinson

The technical perspective from which agricultural research is generally viewed in developing countries often results in research recommendations that are "unfinished" with respect to the needs of small-farm managers in three closely related ways. First, farmers themselves never use a purely technical perspective in managing their farms, and consequently never use one in evaluating new technologies introduced to them by the extension services. Second, recommendations inevitably are presented in the form of "final solutions" or the "best" way to produce. They seek full exploitation of biological potential under the present state of the art. But farmers may be willing and able to handle only intermediate or partial solutions because of the managerial perspective they use and their limited resources. Third, blanket recommendations given, at best, for a specific agroecological zone fail to recognize that economic circumstances dictate farmers' decisions and modify, often dramatically, these agroecological influences.

Agricultural research is tied to a technical perspective and to technical criteria by the essential features of experimental methodology. In the course of the research and extension sequence to develop and disseminate new technology appropriate for farmers, the perspective and criteria have to change from the technical ones inherent in experimentation, to the managerial ones used by farmers.

On-farm research uses a managerial, or systems, perspective to review the results of technical research and to identify—and where necessary modify—those most relevant to the current needs of specific groups of farmers. As used here, the managerial perspective is exactly the same as the systems perspective, but the latter has more validity in the small-farm sectors of developing countries. To be cost-effective, it must be brought to bear on a number of farmers operating the same system. A managerial perspective is appropriate in developed countries where professional farm management advisers interact with individual farmers, but this individual treatment is not operationally viable in developing countries where there are very small farms and a dearth of professionals.

One objective of on-farm research that uses a systems perspective is to develop techniques and products that fully meet the demands of differentiated farmer groups. Another objective is to identify technical constraints to the rapid development of farming systems and to feed them back as agenda items to commodity and disciplinary research specialists. This feedback is the other side of the technical-managerial loop and focuses technical research efforts onto farmers' most important management problems.

The failure of institutional linkages between extension and research is a relatively superficial problem, though one often cited; more fundamental in the research-extension sequence commonly followed in Africa is the failure to use a managerial or systems perspective in the diagnosis of farmers' problems and in the development of recommendations. Neither the research nor extension establishments are truly farmer-oriented because of the dominance of the technical perspective.

In many countries research and extension staff remain skeptical that small farmers are managers in any accepted sense of the word. Such skepticism leads to the belief that "we know what is best for you," an attitude that prevents the extension services from understanding small farmers and feeding back key problems to research. Furthermore, technical compromises,

often the essence of good management, are inevitably seen as farmers' shortcomings. Such attitudes reduce the credibility of the extension staff in the eyes of the local community. In disseminating recommendations, similar anomalies occur. The contact extension officer who lives in the community is often charged with promoting new technologies that he sees as inappropriate for his neighbors. He is thus caught in a squeeze between his bosses and his neighbors. Since the bosses are holding the purse strings, their view prevails, but at high cost to the agent's credibility in the community and his own morale.

This fundamental problem of perspective is certainly reinforced by the characteristic institutional and operational gaps between research and extension services and by the remoteness of station-based researchers from their farmer-clients. The integrated planning and operation of research and extension is clearly desirable. But only the introduction of a managerial perspective to the generation and dissemination of technologies will solve the problem of technology transfer. Farmers' management priorities must be given full weight—first, in modifying technical research findings to meet the needs of differentiated groups of farmers operating the same system; and second, in the planning of research agendas for commodity and disciplinary specialists at research stations.

On-farm research has practical, cost-effective procedures to bring together the technical and managerial perspectives. At the same time, by bringing farmers, extension staff, and researchers together on local farms, it counters the secondary problem of poor institutional linkage.

The Farming Systems Perspective in Technology Development

The use of a farming systems perspective (FSP) in on-farm research (OFR) should follow the five stages outlined below.

1. Identification of Target Groups

Groups of farmers operating roughly the same farming system are identified as targets for research and extension efforts on the basis of policy criteria. Groups identified within a major administrative region form a framework for agricultural planning for that region. The OFR/FSP sequence is then carried out in the target groups by on-farm research teams. These teams are made up of a general agronomist and a farm economist, with an animal production researcher where animals are important in the farming system.

2. Diagnosis of the Target Farming System

The team then takes up to two months to diagnose problems among the target farmers. During this time the technical on-farm researchers (the agronomist and animal production researcher) identify current practices that appear technically weak and fail to exploit fully the biological potential of the locality; they also identify the more obvious pests and diseases. Meanwhile the farm economist gains an understanding of the farming system, of how the farmer allocates his land, labor, and cash to different crop, livestock, and off-farm activities, and of the priorities that the farmer seeks to satisfy through his management of the local ecological and economic environment.

3. Identification of Leverage Points and Technological Interventions

The technical and economic perspectives of on-farm research team members are brought together in a screening process which has five steps:

- Technicians on the team specify technical problems and technically poor practices being used by local farmers and estimate the resulting loss of production.
- Team members specify the technical and economic causes of these poor practices to help identify new technologies. Poor practices can be explained by three sets of factors: (1) the local natural environment; (2) deliberate management of the local environment by farmers to satisfy family priorities (for example, the late planting of maize may allow farmers to exploit a high price for green maize in the local market, or a late second planting may ensure a food supply in places where a mid-season drought is liable to catch the first planting at the vulnerable flowering stage); and (3) the resource constraints which force farmers to make technical compromises. To use the same example, late maize planting may be caused by a scarcity of labor and draft power; farmers continue to plant a late crop even though yields per hectare are poor, because the practice adds more to total production than using the labor to intensify management of the earlier plantings. In these examples the poor technical practice is the same: the late planting of maize. Although this strategy prevents the full exploitation of biological potential and is therefore technically imperfect, in all three cases it is managerially sound. But only when a managerial perspective is used in specifying the cause of late planting can the interven-

tions be identified, for they will differ for each cause.

- In the light of these evaluations, team members specify as wide a range as possible of improved technical practices that can help farmers realize their goals more efficiently. These improved practices are drawn from the results of past research that appears to be relevant to local farmers' needs.
- The resulting inventory of improved materials and practices is screened on both technical and economic grounds. The technicians on the team assess whether the relationships established by previous technical research can be realized under local environmental conditions and farmers' managerial practices; the economist on the team assesses whether the resources required to carry out the proposed technical interventions are within the reach of the local farmers.
- Improved materials and practices which pass this screening stage are then considered for inclusion in the team's on-farm experimental program.

4. On-Farm Experimentation

In collaboration with local extension staff, who participate in all phases, the OFR team designs, implements, and evaluates an on-farm experimental program. The type of experiment is dictated by how much confidence the technical researchers have that relationships identified by previous research are replicable on local farms. Climate, soil, and farmers' managerial practices may modify these relationships. If there is a great deal of confidence that relationships found elsewhere will hold locally, improved technology can be immediately compared with farmers' current technology in verification experiments, with heavy involvement of farmers and extension workers. If there is little confidence that relationships will hold, or if modifications are needed to meet farmers' needs, new measurements must be taken and will require more formal experiments directly managed by researchers, with limited involvement of farmers and extension staff.

The scope of the on-farm experimentation is determined by the resources available to the team. Improved materials and practices that have passed through the screening process are assessed on the basis of their potential contribution to the system, the ease with which farmers can assimilate them, and the amount of research effort needed.

The highest-ranked interventions will have priority in the on-farm experimental program. One or more interventions that can be moved straight into the verification stage should be included, however, to offer local farmers something as soon as possible.

Evaluation of the experiments during the season is done jointly by farmers, extension staff, and the team. The final interpretation of results is made on the basis of a balance of statistical and economic analysis and farmer assessments.

5. Dissemination

The continual interaction between farmers, researchers, and extension staff allows a ready consensus on when improved technology is ready for dissemination. The most obvious sign is when host farmers begin to use the experimental techniques on their own crops and animals. Extension staff who have been involved with the on-farm research program will have an intimate knowledge of the managerial implications of the new techniques and will be able to lay out demonstrations on farmers' fields and expose other farmers in the community to the interventions. When relatively senior extension staff (for example, subject matter specialists in a T&V system) are involved in the OFR program, they will be the ideal trainers for the contact extension staff throughout the target area.

Two points should be emphasized about the approach described. First, extension staff have a great deal of confidence in recommendations developed in this participatory way on local farms. Second, the approach differs from the current top-down system in that whatever technology is diagnosed as appropriate is pulled down into local farm situations, not pushed at farmers, regardless of the specifics of their locality.

A Link between Research, Extension, and Farmers

As indicated earlier, this sequence of on-farm research with a farming systems perspective has three objectives. The first is to identify technical knowledge which, when pulled down into local situations, will enable farmers either to solve key managerial problems or to exploit important managerial opportunities better. The second is to identify technical problems vital to improved management in local farm situations and bring them to the attention of commodity and disciplinary research specialists. And the third is to bring researchers, extensionists, and farmers into contact in specific local farm situations and, by drawing extension staff into the process of developing acceptable technology, to remove the problem of research-farmer and research-extension linkages.

To meet the first objective the OFR/FSP sequence essentially mobilizes the existing stock of research findings

from stations in the immediate vicinity of the target groups or in similar agroecological niches both inside and outside the country, including the relevant international agricultural research centers. If channels of information are effective, the OFR/FSP sequence offers the possibility of bringing all relevant research results to bear on specific local situations. It also provides a method of evaluating these results before experimental and extension resources are committed to their adaptation and dissemination.

To meet the second objective the farming systems perspective is used to identify the unsolved technical problems most important for local farm development. Solutions to their key problems will help improve farmers' ability to manage their local ecological and economic environment. By passing these problems back to the appropriate commodity and disciplinary specialist researchers, OFR/FSP focuses research agendas on the technical problems of most importance to farmers. This guidance to technical research, emerging from the diagnosis of farmers' situations, helps to set research priorities. The relative importance of the various issues fed back to the technical research establishment is assessed from estimates of the expected benefits to the farming systems from a solution to a given problem, the number of farmers likely to benefit if the solution is adopted, and the intensity and duration of the research effort that will be necessary to find a solution.

At the same time, the diagnosis of local farming systems reveals the bounds for practical solutions to the problem—that is, the availability of resources and the managerial practices of local farmers. If technical research programs work within these bounds, they are more likely to identify solutions that are appropriate to the circumstances of client farmers, thus less time will be needed to adapt the research results to specific local conditions.

The third objective is met as a natural outcome of the operating procedures for OFR/FSP. They bring together in local farming situations the three sets of actors—farmers, extension staff, and researchers—in the development and dissemination of technology. The strong linkages that are forged among those actors are another major contribution of this approach.

In summary, on-farm research allows the research product to be finished under the same conditions farmers will face when they adopt the recommendations coming out of the OFR program. The farming systems perspective allows identification of farmers' most important problems, the best opportunities for expansion, and the appropriate technology to solve those problems and exploit those opportunities better. By this process, extension efforts are concentrated on the recommendations most likely to be rapidly absorbed by local farmers, and both research and extension are made more cost-effective.

Operational Linkages for OFR/FSP

In the past, when OFR/FSP has been introduced, national ministries of agriculture have emphasized the restructuring of agricultural research to utilize the new research tool. There has been a move in Zambia and Malawi, for example, toward a two-tier structure for agricultural research organizations. Station-based technical component researchers, increasingly organized into multidisciplinary commodity teams, are seeking new materials and methods, balancing their programs between items identified by on-farm research and exploratory and maintenance research. On-farm research teams guide the agenda of the specialists and adapt their results to farmers' circumstances. The rationale of the two-tier structure is that the OFR teams are wholly area-oriented and can link the single-function orientation of commodity researchers with the area orientation of farming patterns and extension services.

The institutionalization of OFR/FSP within agricultural research organizations is not imperative, however; in fact, its orientation has more in common with that of the extension services. Malawi, for example, is moving toward dual management of its OFR/FSP teams: maintaining the professional quality of work is the responsibility of research managers, and determining priority areas for work is the prerogative of the agricultural development district managers. But whenever OFR/FSP is located outside the research organization, the linkages for drawing commodity specialists into the OFR process and the procedures for basing a significant part of commodity programs on OFR findings must be specifically provided for. There is otherwise the danger that technical research will be isolated from both farmers and extension, much as it is at present.

Strong operational linkages are vital not only between OFR and commodity researchers, but also with local planning bodies (such as the district planning teams in Kenya) and with the extension services. Major responsibilities and working linkages are spelled out below.

Linkages with Commodity Specialists

The linkages described here are those commonly found in anglophone African countries. They are grouped under the two functions of OFR which relate to technical component research: the identification of problems for

the research agenda and the mobilization of research efforts.

Identification of commodity research agenda. In the course of its diagnostic work, the OFR team focuses on technical problems (related to a wheat disease, maize weeding, or animal feeding, for example) important to the development of the local farming systems. Although the team agronomist or animal production researcher will be able to identify the problem, he may wish to call in the appropriate specialist from a commodity team to evaluate both local conditions and farm management practices that relate to the problem. OFR teams, perhaps with the help of specialists, can spell out the anticipated benefits of finding a solution to the problem and the number of farmers likely to be affected and can refer the problems back to the appropriate commodity coordinator. Similar information will come to this coordinator from other regions in which technical research on the same commodity is of importance to farmers.

The commodity coordinator then assesses priorities and determines which problems will be addressed by new technical research programs. Commodity proposals are reviewed by all OFR teams that have referred problems to that coordinator, and annual research planning meetings provide an opportunity for OFR teams to argue the case for research on concerns they have highlighted. Research directors need to lay down policies on what proportion of commodity specialists' programs will be based on the technical problems fed back by the OFR teams.

Mobilization of commodity research. Provision must be made in the budget and work plans must be developed so that commodity specialists are drawn into the OFR/FSP sequence at four points:

- During the identification of priority problems in the diagnostic survey work, as described above.
- During the specification of possible interventions in the screening stage of the OFR/FSP sequence. The OFR technical researchers identify interventions to be developed through on-farm experiments. They may call in commodity specialists to help make adjustments to local farming circumstances and determine the transferability of specialized station findings to the local situation.
- During the design of the on-farm experiments. Commodity specialists may help the OFR team to design more formal experiments that may be needed to measure technical relationships under local conditions.
- During the monitoring of on-farm experiments. The OFR team may call in a commodity specialist to evaluate unexpected factors that show up in experimental treatments on farmers' fields.

Some specialist experiments by commodity teams will always be carried out under local conditions when they are known to differ from station conditions in a way that will clearly influence results. In such situations, specialists should liaise with the OFR team on the question of representative sites and farm management practices that should be included in the experiment as variables. OFR teams, by contributing their knowledge of the local situation, will make the technical results more relevant to farmers. In the early years of OFR, there is a danger that the "establishment" figure, the more traditional and experienced commodity researcher, will dominate the on-farm researchers in planning sessions and will use the teams to conduct work primarily of interest to him. This is something to be avoided.

Linkages with Local Planning Bodies

The importance of linkages between OFR/FSP and local planning bodies hangs on the fact that "choice of technology" is at the heart of the agricultural planning process. Implementation of an OFR/FSP approach helps local planning bodies to reconcile national priorities with the needs of their own local people. First, the target groups of farmers in the local planning region provide a framework for decisionmaking on priorities for OFR/FSP—and therefore on initiatives of the local planning body with respect to agricultural development. Second, the target groups of OFR/FSP provide a "bottom-up" channel for information on their development needs. Local planners can reconcile identified local opportunities with national policies by choosing which interventions to include in the on-farm experimental program in the light of national priorities.

After an intervention has proven to be successful in on-farm experimentation, it is possible to specify the requirements for its dissemination: inputs, lines of credit, extension, processing facilities, and infrastructure. All the supplies and services for a local agricultural development program will fall into place, to be coordinated by the local planning body.

Linkages with Extension

The senior agricultural professional in a region will normally be a member of the local planning body. As such, he will probably have a significant influence on, and certainly be a party to, decisions on target groups for OFR/FSP initiatives. As a result, he can modify work plans and budgets for his extension staff in the areas

of the selected target groups to coordinate their activities with those of the OFR/FSP teams.

Two levels of local extension staff should be involved in the designated areas. First, the senior agricultural extension officer in the immediate area, normally a university graduate, would coordinate with the on-farm research team. Where T&V is in operation, he would ask subject matter specialists to monitor on-farm research or would monitor it himself. Monitoring of the research gives the senior extension officer a voice in decisions relating to the evolution of the experimental program and in recommendations to the local planning body on the content of extension messages. It also enables extension workers to be familiar with the managerial requirements of emerging recommendations and their implications for input supply, credit, and training programs.

Second, lower-level supervisors of contact staff have several roles. Where the structure of the extension service permits, they can organize meetings with farmers to discuss the OFR/FSP program; organize the farm visit program of the OFR/FSP team during the diagnostic survey; interpret for the OFR/FSP team during interviews with farmers, where necessary; help in identifying host farmers for on-farm experiments; help in laying out experiments, in routine recording, and in supervising experimental treatments in the field; and organize meetings between farmer groups, researchers, and senior extension staff on experimental sites to assess the treatment being tested.

The lower-level extension supervisors are thus able to be closely involved with farmers and researchers throughout the development of recommendations. They will then emerge with an inside knowledge of the technology, of farmers' attitudes to it, and of any managerial snags it involves. From their experience with verification experiments they are fully versed in laying out comparisons of improved and current technologies. This knowledge and experience enable them to teach contact extension staff the requirements of the technology and how to lay out demonstrations as an initial dissemination strategy. In cases where extension organization is less complex, contact staff themselves can support the OFR activities.

As this description of linkages shows, OFR/FSP procedures are vehicles for improving the participation of farmers in development decisionmaking, for making new technology more relevant to farmers' needs, and for effectively decentralizing planning. It moves away from a top-down imposition of projects based on national priorities, which are often so far removed from local needs and capacities that they are ignored by farmers.

Table 9-1. ***Years Required for Full Coverage of Target Groups by On-Farm Research (OFR) Teams***
(number of years)

Number of OFR teams	*Number of target groups in country*				
	50	*75*	*100*	*125*	*150*
12	5.2	7.8	—	—	—
18	3.4	5.2	6.9	8.7	—
24	2.6	3.9	5.2	6.5	7.8
30	2.1	3.1	4.2	5.2	6.3
40	—	2.4	3.1	3.9	4.7

Country Coverage and the Costs of OFR/FSP

In any discussion of the cost of implementing a countrywide OFR/FSP approach, it should be recognized that the transport and travel requirements of the professionals involved in OFR/FSP will be at least equal to those of extension professionals, and certainly greater than those of commodity researchers. But the maintenance of research stations absorbs a significant proportion of commodity research budgets, and no such outlays are needed for on-farm research.

The most important question, however, is the number of professionals required to conduct all the functions of OFR/FSP on a national basis. The answer, of course, depends on the ecological and economic variability of the country and on the number of target groups of farmers this variability gives rise to. Table 9-1 shows the years that would be required to achieve full coverage of various numbers of target groups by different numbers of professional OFR teams under the following assumptions:

- Staff are fully trained and operational procedures are established and budgeted for.
- On average, 2.5 professionals are assumed to make up an OFR/FSP team.
- On average, the OFR/FSP team takes 2.5 years to complete the OFR cycle among any one target group of farmers.
- An OFR/FSP team can work with two target groups at any one time.

In the case of an ecologically complex country such as Kenya, for example, if there are 150 target groups of farmers to address, then 40 OFR teams would allow full coverage every five years. Forty OFR teams represent some 100 professionals. That is less than 20 percent of the professional agricultural research establishment,

which leaves over 80 percent to work as commodity specialists. Ecologically more homogeneous countries, with perhaps 50 target groups of farmers, could accomplish an OFR cycle countrywide with as few as 30 professionals and still achieve coverage every five years or so. In view of the present size of professional agricultural establishments in Eastern and Southern Africa, these figures are not frightening.

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10

The Farming Systems Approach and Links between Research and Extension

Bede N. Okigbo

A farming system has been defined as "a complicated, interwoven mesh of soils, plants, animals, implements, workers, other inputs and environmental influences—with the strands held and manipulated by a person called the farmer who, given his preferences and aspirations, attempts to produce output from the inputs and technology available to him . . . It is the farmer's unique understanding of his immediate environment, both natural and socio-economic, that results in his farming system" (CGIAR/TAC 1978). I would add that we can regard a farming system as a set of bioeconomic activities constituting an agricultural business enterprise in which a farmer or farm family orchestrates or manages resources (land, water, and climate) and inputs (labor, capital, fertilizers, seed, tools, and farm animals) purposefully to produce a range of products that satisfy human needs for food, feed, fiber, raw materials for industry, and various other products (Okigbo 1982).

In other words, a farming system is an agricultural production enterprise in which resources and inputs are manipulated to varying degrees. Systems also vary in the extent of integration of crop production and animal production and in their complexity (the number of commodities may range from one to several crops or animals on the same farm). As the number of commodities and subsystems at different sites increases, the complexity of their management also increases in relation to the competition among these components and the ways they interact with the nonfarm activities. Thus a farming system may consist of a specialized enterprise in which a farmer or farm family produces only one kind of animal (for example, chickens) or one crop (for example, maize). It may alternatively be a diversified production system producing only crops, but of more than one kind, such as maize, rice, sorghum, coffee, cocoa, oil palm, coconut, fruits, cotton, or vegetables; or only animals, such as poultry, cattle, sheep, or goats; or both crops and animals.

The farming system may involve the use of traditional, simple, complex, or sophisticated technology, and often traditional and modern elements will be combined. Farming systems are location specific, and whether they are producing crops, animals, or both, they differ from each other in many ways: physiochemical (soils, climate, water, nutrients), biological (crops, animals, weeds, pests), technological (tools, machines, practices), socioeconomic (labor, markets, religion, customs, farmers' and communities' preferences), and managerial (experience, knowledge and decisionmaking). These factors of the production process interact to satisfy one or more objectives (Okigbo 1982).

Farming systems research (FSR), including training, is conducted with a recognition of and emphasis on the interdependencies and relations that exist among these elements in the farm system. FSR attempts to make farming systems more effective by focusing agricultural research on facilitating the generation and testing of improved technology (CGIAR/TAC 1978). Research is an organized quest for new knowledge; on the basis of scientific method it seeks to confirm or refine what is known, to improve methods and techniques, and to develop new materials, varieties, technologies, equipment, and practices. The FSR approach is a holistic way of conducting research. It takes into account the various components of the existing farming systems, and the ways they are managed and interact with each other and the overall environment, in order to make them more efficient and productive on a continuing basis. The FSR approach is of use because it permits an identifi-

cation of the various physical, chemical, biological, technological, and socioeconomic factors and of the ways they function and interact in a given environmental system. According to Spedding (1975), it is only when we understand a system that we are able to repair it, model it, and design, test, and develop new ones. The FSR approach facilitates not only better understanding of the existing farming systems as a basis for their improvement, but also the development of technologies relevant to the farmers' needs and circumstances.

Agricultural extension, according to Leagans (1961), is an educational process that utilizes the findings of the physical and biological sciences and combines them with the principles of the social sciences to bring about changes in knowledge, skills, attitudes, and practices in an out-of-school setting. Agricultural extension is a service or system that educates farm people and helps them improve farming methods and techniques, increase efficiency and income, and better the economic, social, and educational standards of rural life (Maunder 1973).

Extension is an informal approach to education and differs from the formal in that it involves no coercion of any sort and is concerned not with learning for its own sake but with the application of knowledge to everyday life. According to Esminger and Sanders (1954), the emphasis in extension is on working *with* people not *for* them, and thus the focus is on what the people recognize as important. Extension education teaches people what to want and how to work out ways of satisfying these wants. It also teaches them to recognize as problems for solution conditions which they had accepted as inevitable or about which they had felt little concern.

Agricultural extension can be defined as consisting of all activities that help rural families improve agricultural production, find solutions to daily problems of homemaking, and deal with various other aspects of rural living by the application of science and technology to daily needs. Extension workers acquaint farmers and rural people with the results of research and experience in relevant areas of human endeavor; they assist rural people in finding solutions to their day-to-day problems, and assist policymakers in finding ways to improve agricultural productivity and rural welfare—and thus contribute to general economic and social progress.

In most countries, extension is considered essential for increasing agricultural production and efficiency and for achieving rural development. It is usually provided by a specialized institution, which may be a public enterprise or government agency, a private or commercial firm such as a seed company, a credit or settlement project, or various nongovernmental organizations such as religious bodies. The different methods of extension and the organization used are related to prevailing socioeconomic factors, such as land tenure, credit facilities, cultural and historical background, and the nature of educational and other institutions. Various methods are employed in extension including individual and group methods, the mass media, and visual aids.

This chapter reviews the opportunities for and effectiveness of linkages between research and extension with the adoption of an FSR approach.

Farming Systems Research

FSR involves three sequential activities or stages: first, the collection of baseline data and analysis of the farmers' overall environment and prevailing farming systems; second, experiment station work to develop, test, and evaluate technologies to be used in improving the existing farming systems or in designing new ones; and third, the testing, evaluation, and monitoring of technology adoption on farmers' fields and the provision of feedback for research station scientists.

Baseline Data Collection, Analysis, and Study

The first stage involves the collection, collation, and evaluation of data on physiochemical factors, natural resources, and biological, technical, and socioeconomic environments so as to understand better the overall environment or circumstances of the farmers. Included here are data on climate (the pattern and amount of rainfall, temperature, radiation, wind, and so on), vegetation, various types of soil, the potential of the land under different uses, population data, existing farming systems, production and income levels, and the general infrastructure required for agricultural development.

A considerable proportion of the data required comes from secondary sources—geographic literature, agroclimatological data, and relevant studies by sociologists, anthropologists, economists, and agriculturists. Special diagnostic surveys may be used to supplement data from secondary sources. In these surveys, extension workers and farmers are sources of vital and often indispensable information. The surveys are conducted on farmers' fields and often encompass studies of the whole farming system.

By studying the existing farming systems, resource use, input-output relations, major agricultural zones (for both crops and livestock), and production and in-

come data, it is possible to delineate target or benchmark areas and "recommendation domains." Within these areas there is considerable homogeneity that facilitates the identification of locations for further studies and on-farm experimentation (Byerlee and Collinson 1980). This constitutes the diagnostic phase of FSR in which constraints, priorities, and strategies for research station studies are determined.

Development, Testing, and Evaluation

The studies in the first phase enable research to focus on relevant technologies that need to be improved; constraints to be removed or minimized; aspects of traditional farming systems that might be integrated with modern, conventional, or emerging technologies to modify existing systems; and alternative design components that have a high potential for being adopted and are relevant to the needs and conditions in the target or benchmark areas. Research at experimental stations usually does not involve the design and testing of the whole farming system. In the African situation, research is usually concentrated on technologies or components related to selected field systems or subsystems—components that have been identified in the diagnostic phase as having a high potential for being adopted.

On-Farm Testing, Modification, and Monitoring of Technology

In the third phase, studies of various kinds are undertaken at the village level on farmers' fields: they include experiments designed, managed, and executed by researchers; those designed and managed by researchers but executed by farmers; and those designed, managed, and executed by farmers. The researcher-designed, -managed, and -executed experiments may be components of ongoing studies at a research station, in which the farmer has very little role other than that of an external observer. In the second category, farmers execute the research under the supervision or direction of the researcher. The last category represents a situation in which the farmer is more or less in full control of the design, management, and execution. In the first case, the researchers evaluate the performance of the technologies being tested under their control; in the second, they evaluate the adoption of the technology when the research is executed by the farmer. Technology adoption studies focus on the ease and problems of adoption, on the extent, impact, and benefits of adoption, and on changes in farming systems; they include research to identify and quantify the factors contributing to the gap often existing between the yields on a research station and those on farmers' fields.

On-farm research of this kind provides considerable opportunities for feedback to research station scientists. This feedback is most valuable in designing new technologies, modifying existing ones, and determining component technologies that can be integrated with new or emerging ones to improve their performance. The financial viability of new research is also most reliably or realistically assessed on farmers' fields, since plots can be larger than on the experiment station and can offer greater opportunities for sampling different micro-environmental variations (for example, in soil). The testing of technology and system components enables researchers to determine the extent to which technologies are relevant to farmers' needs and circumstances, and often also the extent to which they are ecologically sound, economically viable, and culturally or socially acceptable. The results are more useful when technology adoption is monitored simultaneously from the perspectives of the research worker, farm families, and society as a whole (Gilbert and others 1980).

Certain agricultural development projects also offer an opportunity for testing, evaluating, and monitoring technology adoption. The current On-Farm Adaptive Research (OFAR) network of the International Institute for Tropical Agriculture (IITA) in Nigeria was started by testing some of the institute's technologies in the agricultural development projects financed by the World Bank in the north of the country.

Upstream and Downstream Components

The upstream component of FSR is found both on research stations and on farmers' fields. It consists of studies to determine constraints on increased production and to identify various issues for subsequent analysis in order to determine priorities, strategies, and key problems for research at the experiment station. In addition, the studies attempt to identify problems faced by producers directly or in relation to deficiencies in policies, infrastructure, and services. The downstream component involves the on-farm testing and evaluation of technologies and system components developed by researchers on research stations. The full benefits of these complementary components of FSR can be derived when FSR programs are effectively linked with other technology development programs—such as commodity improvement, pest management, mechanization, and commodity (crops and animals) production subsystems—so that the various components can be as-

sessed in the integrated context in which they will need to perform (CGIAR/TAC 1978).

Gilbert and others (1980) noted four stages of downstream farming systems research: descriptive and diagnostic, design, testing, and extension. These stages are usually sequential and closely linked. At the descriptive or diagnostic stage a specific farming system is studied in relation to the total environment and its constituent production systems (for example, field systems in the African context). This facilitates identification of farmers' constraints, of competition among the various subsystems, and of the extent of flexibility in management in relation to farmers' objectives. At the design stage, a range of alternative strategies or technologies must be considered in order to identify and select those constraints that have the best chance of being resolved. The testing stage involves the study and evaluation of promising alternative strategies, technologies, system components, or subsystems in farmers' fields. This is done initially through joint activities of the researcher and the farmer, and finally takes place under the overall control of the farmer. The extension stage is reached when the proven strategies, techniques, or input mix are ready for wider use or implementation.

These stages are by no means markedly different from those of upstream farming systems research. The CGIAR/TAC (1978) review noted that FSR consists of the collection and analysis of baseline data, research station studies, and on-farm studies. The baseline data collection and analysis constitutes the descriptive and diagnostic stage, which results in the design or selection of the strategies and technology or input mix to be tested and evaluated at the research station. The most promising practice or practices are then selected for on-farm or downstream studies. It is only in the baseline data collection and analysis stage, and to a limited extent sometimes in the downstream phase, that the whole farm system is considered or studied.

Need for Interdisciplinary Interaction

Because of the multidisciplinary nature of farming systems and hence their complexity, specialists in many disciplines are needed to tackle simultaneously all the problems that have to be addressed if existing systems are to be improved. Farming systems research requires effective planning, management, and cooperation among disciplines, rather than the classical narrow or "elementalist" disciplinary approach to research that addresses the problems piecemeal. The crucial management problem in FSR is that scientists on multidisciplinary teams must work with disciplines in which they are usually not trained. Economists, sociologists/anthropologists, agroclimatologists, soil scientists, agricultural engineers, plant breeders, weed scientists, and others interact to study various aspects of the problem and integrate the results into a management package to improve the farming system.

According to Gilbert and others (1980), unlike the usual top-down approach in which social scientists are called in mostly for ex post evaluation after a project has been implemented, in the FSR approach they are brought in for ex ante evaluation to help in the planning and design. This makes farming systems research both an analytical and an integrative process. It is also an iterative process whereby the various stages are continuously repeated in varying degrees, since at any given time only certain elements may be identified and proven to be the most acceptable ecologically, economically, and culturally.

Institutionalization and Popularization of FSR

According to the CGIAR/TAC (1980) review, the development and use of FSR was pioneered by the international agricultural research centers (such as IRRI, IITA, CIMMYT, and CIAT), by a few national institutions such as the Institut Sénégalais de la Recherche Agricole (ISRA) in Dakar and the Institute of Agricultural Research (IAR) at Ahmadu Bello University, Nigeria, and by regional programs such as the Centro Agronómico Tropical de Investigación/Enseñanza (CATIE) in Turialba, Costa Rica. The approach has recently been widely adopted, since its main objective is the improvement of smallholder agricultural production systems. But it is worth stressing the need for continuous effective collaboration between international, regional, and national research programs to ensure effective linkage with and relevance to the farmer.

The international research centers give priority to the development of principles, methodologies, basic knowledge in FSR, and training. National programs, which may be viewed as clients of the international centers, play important roles in ensuring contact with farmers in on-farm research, testing, evaluation, and monitoring of adoption. They are usually also more concerned with adapting technologies to specific environments or conditions in their own countries. Areas of cooperation between international and national programs identified by CGIAR/TAC (1980) include data collection, interpretation, and information exchange; setting priorities for and planning FSR; adaptation and introduction of new technology within existing farming systems; development and introduction of new farming systems; and training.

Linkages between FSR and Agricultural Extension

Allo and Schwass (1982) have observed:

> The extension worker should be the link between research and the farmer and should be able to evaluate the results of research under his own local conditions. Most research is conducted at central institutions, often located considerable distances from the area where the extension officer is working. Consequently, the results of a particular piece of research conducted in one area may not be valid for another, because of differences in soil type, climatic conditions, etc. The extension worker must therefore study results of all research into the types of production systems found in his district, to see whether they are applicable in his own area—this will usually mean that he has to implement his own field experiments to test the research results. Such experiments have a two-fold benefit, in that they enable the validity of the research to be tested under local conditions and, at the same time, demonstrate the techniques and results to local farmers.
>
> The extension worker should also be a link between the farmer and the specialist. There will be times when the extension officer encounters problems which he cannot solve. Under these circumstances, he should solicit the assistance of an appropriate specialist rather than guess at a solution.

Mosher (1976) has observed that "research and advisory services in many developing countries are not such as to win the confidence of farmers. Research workers, few of whom have a farm, spend a large part of their time in laboratories or central research stations and little time in the field: They have little first-hand knowledge of production and related economic problems confronting farmers and contribute little toward their solution."

These observations are true of what happens under conventional disciplinary research with a top-down approach from research to extension. The FSR approach, however, provides opportunities for constant interaction and linkage among researchers in several disciplines, and between researchers and extension workers who are usually in more direct touch with farmers themselves. It also ensures that both researchers and extension workers understand the farmers' production systems, needs, and resource availability, and the interaction of farming systems with the environment, on-farm and off-farm.

At various stages of FSR, research is effectively linked to extension and the farmers who are both targets and clients of researchers and extension workers. Baseline data collection and analysis, for example, include diagnostic survey and study of the farmer's environment and farming system, and on-farm adaptive research calls for the farmer's participation in technology design, testing, and evaluation. By study and consideration of the whole farming system during the on-farm diagnostic upstream component of FSR, definite efforts are made to define the target area and the prevailing farming systems, to set priorities in research, to identify constraints and the farmers' resource base, and to determine strategies that will ensure that the technologies developed are relevant to farmers' needs and circumstances. This approach also facilitates adoption and makes extension work easier. Moreover, the feedback process engendered by testing and evaluating technologies on farmers' fields links the researcher to the extension worker and the farmer, all of whom are participants in the same endeavor.

Collinson (see chapter 9) observed that on-farm research with a farming systems perspective links farmers, technical research, and extension. He noted that the more serious failures in institutional linkage in the research-extension-farmer continuum do not lie (as is usually assumed) between researchers and extension workers; they occur when both the researcher and extensionist are unable to perceive farmers' problems from the farmers' point of view.

The FSR approach eliminates these failures by ensuring that the farmers' decisionmaking process and managerial point of view receive the same emphasis as technical perspectives and criteria in the development of technologies. In on-farm research a special effort is made to identify the needs of the relevant group of farmers, to inform the various disciplinary researchers of the most pressing problems in the farming system that need research, to bring researchers, extension workers, and farmers together on the farm so that linkages between them are strengthened—and to give priority to local situations and to screen results of research before experimental and extension resources are committed to their adaptation and dissemination. Thus with on-farm research the technology is finely tuned to target areas, farmers, and farming systems. The diagnostic process in FSR focuses the attention of researchers and extension workers on farmers' priority problems, and consequently the results of the research are likely to be more cost-effective.

Collinson further described a two-tier research network in which area-based on-farm research teams guide the research agenda of multidisciplinary station-based commodity teams and adapt their output to the needs of local farmers. In other situations, on-farm research teams are jointly managed by researchers and

extension workers and their area-specific orientation gives them more in common with the extension organization than with research.

FSR not only provides opportunities for linkages between research and extension but it also closely parallels and is more or less interwoven with extension. This view is confirmed by various authorities. Mosher (1978) emphasized that "the extension worker needs several different kinds of understanding: an understanding of crop and livestock production, an understanding of farming as a business, an understanding of agricultural development, an understanding of farmers and how they learn, and an understanding of rural society." FSR, especially with respect to the diagnostic phase and on-farm adaptive research, gives priority to understanding the farmers' overall environment, farming system, resources, decisionmaking processes, constraints and needs, problems and process of technology adoption, and the interaction of the farming system components among themselves and with the nonfarm rural and urban environments. Thus both the extension worker and the research worker have to understand not only the farmers' environment but also the different factors listed by Mosher.

Mosher (1978) also listed some useful guiding principles for agricultural extension:

- Extension activities should be conducted where the rural beneficiaries live.
- Extension should treat all farmers and their wives as rational beings.
- Each new or changed practice must be both technically sound and financially profitable; it should also be socially acceptable.
- Each changed practice should be demonstrated or otherwise discussed with farmers before they use it.
- The unit of instruction in extension teaching should, in most cases, be a single new method or changed practice.
- Extension activities can markedly affect farm production only in localities where production can be increased by extending the use of technologies already available, and where outlets for farm inputs and markets for farm products are already present and efficient.
- The impact of extension on farm production will normally be greatest in farming localities where there are also production credit facilities, local verification trials, and farm-to-market roads.
- The intensity of extension service activities should be varied in different parts of a country, depending on where the need to increase farm production is currently most pressing.

The holistic approach in FSR emphasizes the farmer's overall environment; farming system objectives, constraints, and needs; farm-level trials in which farmers participate; identification of infrastructural and policy deficiencies; and feedback to research station scientists. FSR thus has built-in provisions that make an extension program effective. Moreover, the farming systems approach can ensure that women receive attention commensurate with their strategic importance in agricultural production and related nonfarm activities. Too often the problems and needs of women are neglected in both research and extension, especially by male functionaries.

Supporting activities for extension education include local verification trials, use of subject matter specialists, and the analysis of, experimentation on, and evaluation of extension techniques (Mosher 1978). These activities are built into various phases of FSR. Mosher (1976) and Ruttan (1982) emphasize the importance of socioeconomic research in both ex ante and ex post evaluations of agricultural technologies, and this is also a vital component of FSR.

IITA Experience with FSR

The international agricultural research centers conduct their research and training activities in accordance with well-defined mandates for specific commodities, ecological zones, and regions. The International Institute for Tropical Agriculture (IITA) has a world mandate for cowpeas and yams, a mandate for farming systems research in the humid and subhumid tropics, and a mandate for rice, maize, and cassava in Africa. Since the early 1970s the IITA has conducted research in crop improvement and farming systems, has generated technologies, and has undertaken numerous training activities. The technologies developed have been adopted to varying degrees through the following linkages between research, extension, and farmers:

- Multilocational trials conducted in crop improvement programs
- Use of demonstrations, visits, conferences, workshops, and the media to inform the public about the results of research station and on-farm adaptive research
- Upstream farming systems research (descriptive and diagnostic) to determine priorities and strategies in research, especially with respect to the

specification of technology characteristics of relevance to the farmers
- Downstream on-farm adaptive research on farmers' fields or in agricultural development projects
- Training programs.

The Upstream Phase of FSR

IITA's studies in different parts of Nigeria have helped characterize the existing farming systems and identify subsystems for improvement. Through these studies it has been found, for example, that

- Although there is a division of labor among the sexes in farming, the women in western Nigeria engage more in trading than in farming, unlike their counterparts in southeastern Nigeria.
- Livestock is variously integrated with crop production in traditional farming systems, and the number of livestock per farm family increases with human population density.
- The different field systems managed by the same farmer or farm family compete with each other for labor and other resources.
- Trees are grown in farm compounds and are used to outline fields; thus agroforestry is of obvious relevance.
- Trees on the farmers' fields sometimes shade the crops and limit yields, but new crop varieties are tested only on open fields at research stations.
- Soil fertility is maintained primarily by allowing fields to lie fallow; sometimes crop residues and household refuse are used.
- As farmers cultivate their fields with increasing frequency, they find it more and more difficult to maintain fertility and productivity.

Observations such as these help determine the relevance of technologies to given environmental and socioeconomic conditions and thereby improve the chances of their adoption.

Downstream On-Farm Adaptive Research

The on-farm adaptive research of IITA not only has provided opportunities for the adoption of many varieties, but also has increased knowledge about farmers' preferences and the technology characteristics desired. For example, it has been learned that:

- Farmers in the more humid areas grow and use cowpeas as a vegetable, although those in the savanna areas prefer them for their seed; IITA therefore began to work on vegetable cowpeas in addition to the seed.
- Farmers like early-maturing maize varieties as a catch crop, especially when the maize is not chaffy and is thus suitable for consumption on the cob.
- Large-seeded cowpeas with wrinkled testa are preferred in food preparation because of their shorter cooking time.
- Farmers are interested in shorter maize varieties for intercropping.
- There is a need for both yellow- and white-seeded maize varieties for poultry and human consumption, respectively.
- Soybeans are being used more and more as a condiment and a substitute for traditional locust beans and are thus in greater demand as a cash crop and for local consumption.
- The maize streak virus and striga infestation are especially serious in the savanna areas; as a result, a high priority is being given to breeding for resistance to these diseases.
- There is a high incidence of maize borer in second-season maize at Umudike in southeastern Nigeria; IITA was therefore able to use the area to screen for borer resistance without developing expensive rearing facilities.

Through the years IITA has been involved in technology testing and evaluation in various rural and agricultural development projects in cooperation with national institutions. These include the National Accelerated Food Production Program in Nigeria, World Bank–financed agricultural development projects, and several bilateral or multilateral foreign assistance programs. IITA's International Cooperation and Training Program, with the support of USAID, GTZ, IDRC, the European Economic Community, and the Ford Foundation, has coordinated projects in Burkina Faso, Cameroon, Liberia, Nigeria, Rwanda, São Tomé, Sierra Leone, Tanzania, and Zaire. Lessons learned from these experiences include the following:

- In Anambra, Nigeria, improved high-yielding cassava did not have as high a percentage of starch or dry matter as did local varieties; the breeding program was therefore modified to produce new varieties that contain more dry matter and are more suitable for local food preparation.
- In trials on farmers' fields, none of the upland rice varieties developed at IITA and elsewhere were pref-

erable to the recommended widely grown OS-6 variety. (Several new IITA varieties that meet local preferences are now available).

- Improved maize varieties used in southern Nigeria were found to be inferior to local varieties for eating, either boiled or roasted on the cob.
- In Burkina Faso it was shown that preplanting cultivation and tied ridges were more effective in increasing maize yields than zero tillage, which had been found to be effective in Nigeria.
- In Zaire it was found that cassava leaves are as valuable as the roots as a source of carbohydrates or energy. Consequently, priority was given to developing varieties with high yields of good leaves and to methods of harvesting them.

These few examples demonstrate how linkages between farming systems research and extension can promote the adoption of new methods and varieties.

Problems in Adopting the FSR Approach in Africa

Although considerable progress has been made in institutionalizing FSR in several countries in Africa, and although some national programs (ISRA and IAR) helped pioneer the development of this relatively new area of agricultural research, effective implementation of FSR is far from widespread in many African countries. Reasons include:

- The shortage of experienced and qualified staff at appropriate levels and in relevant disciplines, especially in the socioeconomic fields (the most serious shortage is that of women researchers and extensionists)
- Weak national research and extension services
- The lack of experience in managing conventional disciplinary research, let alone FSR
- Problems in the management of multidisciplinary research teams by scientists trained and experienced in a single discipline
- Ineffective linkage between national programs and international research centers, in part because of staffing deficiencies and the lack of bilateral, national, and other projects that would facilitate linkage
- Institutional deficiencies in developing countries, especially in relation to education, research, and extension and to the linkages between them
- Constant changes in personnel, governments, and policies
- Difficulties in communicating with farmers because of their high illiteracy rate and because expatriate scientists are often unable to speak the local language.

This list is by no means exhaustive, but it calls for the international and national research institutions and the cooperative programs in which they are involved to make a concerted effort to develop the capacity for conventional and farming systems research in Africa. It also calls for cooperation among African countries, in addition to cooperation among regional and international institutions.

Adapted from a paper presented at the seminar on Agricultural Extension and Its Link with Research in Rural Development, Yamoussoukro, Côte d'Ivoire, February 17–23, 1985.

11

The Farming Systems Approach in Senegal

Jacques Faye

What is the farming systems approach, which seems to be somewhat theoretical, really attempting to do? And why are most external lending agencies beginning to provide financial support for this type of research?

Since 1979 teams have been formed in most countries in Africa to conduct research on production systems. Furthermore, the list of colloquiums and workshops held in Africa on production systems is a lengthy one: at least three or four a year since 1979. Most revealing, however, is the number of workshops that bring together agricultural research workers and rural development specialists for training in research on production systems. The CIMMYT team based in Nairobi, the International Institute for Tropical Agriculture in Ibadan, and the Farming Systems Support Project at the University of Florida have been leaders in this process, organizing workshops at full tilt and distributing an ever growing body of literature on the subject.

None of this would be possible without financial assistance from external agencies and technical support from the international agricultural research institutions and universities in the United States. Since independence in Africa this is arguably the most important involvement by lenders in national agricultural research agencies. Clearly, there is a call for a new approach to agricultural development issues.

One explanation for this seemingly profound change in the research agencies and in their objectives lies in the failure of most of the development undertakings launched since independence. Furthermore, the transition from relatively simple operations involving a single crop (usually for export) to integrated rural development projects has not improved the situation.

Many new technical practices tested at research stations and recommended to farmers have not been adopted or have had only limited acceptance by a minority. It is often the researchers and policymakers who have determined what was useful and of highest priority for farmers, without being aware of farmers' own constraints and concerns. Practices have often been recommended for dissemination without any prior testing or evaluation in the farmers' fields. Most frequently, technical aspects have been emphasized and the problems of adaptation to the social mores and customs of rural societies have been neglected. This is true with regard to the training and organization of farmers, as well as the creation of public and private agencies charged with providing services to farmers efficiently and at an acceptable cost.

The farming systems approach addresses the following questions. What problems do farmers face and which are the most critical among them? What solutions are available already, and what needs to be researched to obtain other solutions? How can potential solutions—with all their technical, economic, social, and institutional implications—be tested, adapted, and evaluated in cooperation with farmers before an attempt is made to extend them to large numbers of producers?

The methodologies of the farming systems approach make it possible to identify real problems, offer possible solutions, and verify their validity before disseminating them. It must be pointed out that the international research institutions tend to emphasize problems and solutions that are primarily technical and economic, undoubtedly because of the political sensitivities associated with a social and institutional perspective. In Sen-

egal, however, farmers' associations and organizations, their problems, and the services provided to them are also considered to be the target of research; as a result, social and institutional concerns *are* addressed by systems research.

Systems research does not eliminate or downgrade the value of analytical research performed in the field or the laboratory. Research on varietal improvement, fertilization, mechanization, animal feeding and health, and the like must be not only continued but reinforced. In Senegal there is no systems research without analytical research; the two are complementary and must be developed at the same time. This point should be underscored: those engaged in systems research need analytical research personnel at virtually every stage of their work—to examine in detail the problems identified, to develop and refine solutions to those problems, and to test the solutions and tailor them to the actual conditions faced by farmers.

Accordingly, researchers need to continue working in the field and in the laboratory. And because the human and financial resources of developing countries are limited, close cooperation is needed between the national agricultural research agencies and the international research institutions.

The Senegalese Agricultural Research Institute

In 1975 several former French research institutes were merged to form the Senegalese Agricultural Research Institute (Institut Sénégalais de la Recherche Agricole, or ISRA). ISRA has a very wide range of activities, from research on agriculture, animal husbandry, and forestry to oceanography and rural social and economic affairs. Reorganized in 1982, it now consists of regional multidisciplinary agricultural centers. It has research departments concerned with plant production, animal production and health, forest products, oceanography and fishing, and—in particular—rural production systems and technology transfer.

The latter department is responsible not only for systems research but also for analytical or topical research on plant production (agroclimatology, mineral and organic fertilization, soil studies, weed control, rural mechanization, postharvest technology, water resources for agriculture). The department's mandate is to carry out research programs in five agricultural regions of Senegal:

- Basse Casamance, in the southwestern part of the country, has traditionally been a region of rice cultivation in the floodplain, but because of repeated droughts upland crops are being introduced. Groundnuts are now the leading crop.
- Haute Casamance, in the southern part, is Senegal's most important cotton-growing region, but stockraising is also important, as are cereals and groundnuts.
- The Siné-Saloum region is foremost among the groundnut-producing areas, but the local Wolof and Serer ethnic groups also engage in millet farming and stockraising.
- In the Senegal River valley the construction of two dams is expected to bring several hundred thousand hectares under irrigation, mainly for rice growing.
- The Ferlo region, south of the Senegal River, is known as the forest-pasture region but is now criss-crossed by boreholes. The deterioration of pasture land is increasingly forcing the Peul herdsmen to move their cattle toward the river valley in the dry season, particularly toward the south where water is more abundant.

Three research teams have already been put in place: the first in Basse Casamance in 1982, the second in the Senegal River valley in 1984, and the third in the Siné-Saloum region also in 1984. In each area is a team consisting of an economist, a sociologist, an agronomist, and an animal husbandry specialist; in the forest-pasture region a specialist in pasture management replaces the agronomist. These teams are based at ISRA's regional centers and work with ISRA research staff on specific topics.

Each team follows the same basic procedure and methodology. First, it studies farmers' production systems in the context of the area's environment and agricultural systems; it then identifies constraints and ranks them; together with the farmers it formulates, tests, and evaluates measures to overcome the constraints identified; and finally, it assists in publicizing these measures through the regional development companies.

Two complementary methodological tools are used: surveys of farmers and tests of practices and social innovations. The comparative importance of each instrument is determined by the research objectives, which in turn depend largely on the agricultural region and on the results already obtained. It is in essence a trial and error method. The surveys allow tests to be devised, and analysis of the tests permits the knowledge gained to be verified and refined. But because each region has its own characteristics and agricultural potential, the problems and objectives of research will be specific to each program.

The Research Program of Basse Casamance

Although experience in Senegal is somewhat limited, the Basse Casamance program offers the most useful lessons thus far. The research team based at the Djibelor regional station began the program in early 1982 with a review of scientific and development literature. It then conducted exploratory surveys in some thirty villages with the help of an expert and an interview guide prepared by the team. Villages were selected for survey on the recommendation of field agents of the development company. The surveys were conducted in the dry season and lasted three months, but the ideal time would have been at the end of the winter season, when the crops could be seen in the field.

After visiting and interviewing local authorities, the researchers made an extensive inspection of a particular area, accompanied by farmers, and discussed what was observed in the fields. Upon their return to the village, the researchers held community and individual discussions in public and on farms so that some matters could be addressed in greater detail and other questions raised. After each trip a member of the team prepared a report on the visit. All reports were discussed, to ensure that they reflected everyone's concerns.

After all the information gathered in the field, found in the literature, and obtained from the various agencies had been analyzed, Basse Casamance was divided into five agricultural categories, or zones, on the basis of three criteria: first, the division of labor by sex (among the Diola of the south and west, men and women work together in the rice fields, but perform different tasks; among the Diola who have come under Mandingo influence the men work only upland crops, leaving floodplain rice cultivation to the women); second, the proportions of land devoted to rainfed agriculture and to flooded rice fields, since different cultivation systems are required; and third, the use of animal traction. Two villages were selected in each zone, one in which only surveys would be taken, and a second that was targeted for both surveys and tests. A census of all agricultural operations in ten villages then made it possible to form a sample of 125 family enterprises, comprising 230 farms, for the surveys and tests. This was a random sample, but it will be reformulated as a stratified sample so that valid recommendations can be made for each zone and target group. Simultaneously, priority research problems requiring detailed analysis or testing were identified.

A second phase began with the 1982 winter season and consisted of two closely related aspects, formal surveys and tests. The formal surveys were designed to verify, refine, and quantify the information obtained in the first phase. They were conducted in Basse Casamance by the investigator assigned to each village, using questionnaires. Owing to the staggered arrival of the team of researchers (one agronomist and two economists in 1982, one sociologist and one animal husbandry specialist in mid-1983), the surveys and tests were also staggered and their timing does not necessarily correspond to the ranking of the constraints identified.

The first survey compiled basic data on farm operations: number of people, layout of the land, and inventory of resources. The second survey sought data on cultivation, from soil preparation to harvest. It followed the timetable of the various tasks involved. Periods of work were recorded by activity, crop, and type of equipment. These records gave the economist an initial idea of the resources available on farms and the periods of peak utilization of labor for each zone. The agronomist gained a better knowledge of the agricultural timetable, cultivation practices, the distribution of crops, and levels of output.

An agronomic survey related to cultivation methods covered the entire sample in the target villages and was expected to last at least four seasons. In the winter of 1984 an economic survey and a study of farm operations were added to the surveys already mentioned. They are being conducted on a subsample of thirty farms selected for their representativeness.

In the area of sociology, three lines of research were identified: the social organization of agricultural operations, problems of landownership, and the impact of migration on production systems and agricultural organization. The sociologist began these studies in early 1984 and is combining direct observation, questionnaires, and genealogical surveys to supplement the data available elsewhere.

The arrival of specialists in animal husbandry and rural equipment made it possible to undertake analytical surveys on stockraising and animal traction systems. These surveys were to be continued in 1985 and tests begun on farming with oxen, animal health, and the use of animal waste on cereal crops.

Tests made in the agronomic area in 1982, 1983, and 1984 covered four main themes:

- The intensification of cultivation systems (tests of fertilizers, herbicides, and maize and rice varieties)
- Diversification (tests of varieties of sorghum, millet, cowpeas, sweet potatoes, and cassava)
- The recovery of abandoned areas (tests on the reclamation of saline soils)

- The use of residual moisture (tests of sweet potatoes following rice in low-lying wetlands).

The purpose of these tests was to help prepare and evaluate new technical guidelines and compare the new methods with those now in use, data on which were compiled through the agronomic survey described above. In general, the tests address two phenomena: the technical value of the newly recommended practice (yield, work time, upgrading of marginal areas) and the adaptability of the new recommendation to the present system (planting and harvesting dates, weeds, fertility levels, and the resources available to farmers). The tests are made in two different but complementary settings: at the test station and directly on farms. The station tests are concerned mainly with the technical value of the newly recommended practice. Farming systems tests differ from other station tests not in their procedure, but rather in their underlying logic and their objectives. For instance, in a test to compare upland rice yields under four different weeding regimes, the treatments were designed to simulate cultivation practices actually used by farmers, and productivity was measured in terms of yield per day worked. Each year the agronomic unit begins ten to twelve tests at the station, devoting nearly 25 percent of its time to this activity. In the farm villages themselves, the agronomic component assesses the technical advantages of the newly recommended practices, as well as their adaptability to the present system. All such tests are made by the farmers, assisted by the team representative. Frequent visits to the site (every two weeks by researchers, every two or three days by an observer) ensure the technical validity of the test. During these visits soil samples are taken and agronomic and plant health observations are made. In general this procedure involves no repetition, but the tracts of land are quite large (500–1,000 square meters) except in the cases of groundwater rice and lowland rice, where the plots are small (30 square meters). Tests of fertilizers and varieties are repeated twice because of inexperience thus far with testing on the farms.

The new practices are evaluated through discussion in the field with farmers and statistical analysis of tests when circumstances permit. The agronomists take account of a number of factors (soil analysis, time worked, past crop history, rainfall distribution, colleagues' opinions) when interpreting the results. Upon the completion of the tests, the farmer is able to adopt the new practice directly; if he rejects it the agronomist can identify the stumbling blocks and make a further assessment of the proposed practice.

When the farmers' reaction is favorable the tests are simplified, taken over by the farmers, and made on larger areas. This has been the case, for example, with early rice varieties such as IRAT 112 and 133, early varieties of sorghum, sweet potatoes after rice in the groundwater zone, and the use of herbicide on rice. After three years of experimentation, truly large-scale demonstration tests are now possible.

Other recommendations have been rejected by the farmers. Sometimes the practice is not accepted because it requires too much labor for too small an increase in yield (as with flat tilling and thinning of maize and flat tilling of rice) or because the method does not always work (fertilization of groundwater rice, fertilization of groundnuts). In either case, the tests must be conducted both on the village farm and at the station in order to understand the reasons for failure.

The team's activities are not limited to this fieldwork. In line with the farming systems approach, the team members must maintain close liaison with other research programs so that researchers will be made aware of the technical problems faced by the farmers and therefore of their priorities. In addition, the team involves other research programs in its own analyses, and tests are formulated and analyzed jointly. After each season, specific recommendations are forwarded to the research programs to assist researchers in focusing their work.

Farming systems research must also establish permanent links with the regional development company, not only to take its requirements into account, but also to ensure that the limitations imposed by agricultural policy (with regard to farm prices, marketing, farm credit, distribution of factors of production, organization of farmers, technical services, and so on) are removed where possible to permit the adoption of innovative techniques by farmers. In fact, farming systems programs are implemented only in regions where a development company is active, in order to ensure dissemination of the results. In the Basse Casamance region the agreement with the regional development company sets forth in detail the commitments made by each party and the way in which relationships are to be conducted. A research-development liaison unit established for this purpose meets regularly to discuss activities in the area, assess results, and decide upon their dissemination. Within this unit, technical committees of researchers and extension agents from the same areas have been formed for site visits, tests, and joint surveys. In 1984, on the basis of work done by the team and other ISRA research personnel, demonstration tests were initiated throughout the region, conducted by extension agents but with the participation of researchers.

With regard to agricultural policy, in 1982 ISRA set up an Office of Macro-Economic Analysis, reporting to the

director general. This office conducts technical and economic studies, as well as studies of specific topics and agricultural policy, to obtain a better comprehension of the socioeconomic environment facing farmers and to prepare recommendations to agricultural policymakers within the government. The research staff of this office (especially the economists) work in close cooperation with the research teams studying production systems.

Conclusion

Although the Senegalese experience is still too recent to yield meaningful conclusions, a few comments are in order.

The first is that the literature on the farming systems approach focuses excessively (not to say entirely) on the farm and its production system. In the countries of the Sahel, however, desertification and population growth compel us to take account of external influences on the farming system: for example, the agricultural land used in common by a village or rural community and the grazing land used by herdsmen.

The second comment is that most theoreticians of the systems approach implicitly exclude any study of social change, whereas such research would be of great value to African governments. How can farmers be assisted in organizing and taking over publicly provided services? How can farmers' savings be mobilized to set up an agricultural credit system? These are issues that cannot be ignored.

Third, there is a need for a great deal of pragmatism in the implementation of a systems approach. The working conditions, financial resources, personnel qualifications, and institutional setting of the international agricultural research agencies are totally unrelated to those of our local research institutes.

Our teams are often very young and inexperienced and so must "make haste slowly." The management of our research agencies is not always very effective. Often the necessary equipment is not in place: a vehicle that is broken down when tests are to be started can mean as much as a year lost. Furthermore, within our research agencies and at the national or regional level among the various development and research institutions—even between ourselves and external sources of financing—we waste too much time in quarreling, in discussing prerogatives, and in arguing over the allocation of the meager resources available. Unlike the international research institutions, we cannot afford those who disagree or who do not wish to change; we must therefore be prepared to explain, persuade, convince, and accept compromise—all solely in the interest of our farmers.

The fourth comment concerns the links between systems research and subject research and between research and development. The inclusion of research on production systems in the work programs of the national agricultural research agencies gives rise to a number of problems. Socioeconomists have joined these agencies on a massive scale. Work in the countryside using new methods differs greatly from the controlled, rigorous practices at stations and in laboratories. Often, if not always, this new arrangement requires profound changes in the organization of the agencies and in the distribution of functions and powers. As a result traditional researchers sometimes perceive these changes as a power grab from another quarter. How can a seed selector, for example, be convinced that his work on high-yield sorghum varieties does not have priority and that he should direct his efforts toward developing medium-yield varieties more resistant to drought and disease and requiring less fertilizer?

The effectiveness of the farming systems approach presupposes that researchers and developers will gradually become involved in the same problems of development in a given agricultural region and that together they will try to involve the policymakers. Long and sometimes arduous discussions are required before researchers acknowledge that they are not the only ones qualified to talk about research and what it should do, and before developers also accept this fact as it relates to agricultural development. The Senegalese experience shows what will be needed: a great deal of patience, time, and persuasion—built upon success in the field.

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Extension under East African Field Conditions

Jon R. Moris

Unlike other public services—such as primary schooling, police protection, and health care—agricultural services depend greatly on specific features of the local economy: the crops that are grown and how each is handled within the economic system. Most African countries have several forms of agricultural extension, some differentiated by crop and others by ownership (public or private) or by ecological zone. The root difficulty faced by most of these extension systems is that farms are very small, mainly as a result of reliance on hand cultivation where labor is in short supply. In the more densely settled parts of Africa, average holdings tend to be less than two hectares, so that any service agency (whether public or private) must deal with hundreds of smallholders scattered over the landscape.

Because of transportation costs, farmers with less than a hectare planted to a given crop do not constitute an attractive market for inputs and commercial advice. This situation explains why African countries with well-established commercial services for farmers tend to be those such as Botswana, Kenya, or Zimbabwe where large farms were established in an earlier period. Elsewhere, governments have been forced to set up surrogate organizations—cooperatives, development projects, parastatals, or general extension services—which articulate farmers' combined interests and manage their purchasing power.

This chapter will focus on agricultural extension offered by means of an administratively organized extension service, usually linked to a ministry of agriculture. Such services are common in East and Southern Africa, but are typically not developed to the same degree in parts of francophone Africa where commodity-oriented organizations are more common. The constraints on effective interaction between field agents and farmers are, however, the same in much of rural Africa.

Under any form of agricultural extension, the methods for actual contact with farmers are broadly similar: either group meetings with farmers or individual visits by farmers to an office or by extension staff to farmers. Even under favorable conditions, offering agricultural advice to smallholders is a demanding task not easily subject to routinization. The intrinsic difficulties include the highly seasonal character of agricultural production, the crop-specific nature of much extension advice, the variety of crops grown in diverse ecological settings, the scattered clientele, the need for a high level of diagnostic skill among those dealing directly with farmers, the multitask and multifunctional nature of the extension process, the indirect link between extension services and actual output, and the extreme resource constraints of individual farmers.

As a consequence, there are always tradeoffs to be made in arriving at an effective mode of field organization for agricultural services. Communities with a single cash crop (such as tea or tobacco) are likely to need extension advice in a different form from those where a variety of traditional food crops provides farmers' main income. There is, in effect, no single model for agricultural extension which will suit all circumstances. Most African countries display a range of organizational options: export crop-based parastatals, a general extension service that emphasizes crops such as maize, project-linked irrigation or livestock services, and perhaps farmers' cooperatives and committees. In certain areas commercialization may be sufficient to support extension by private firms (generally linked to the supply of inputs and machinery).

Under any of these five structural options, the people actually dealing with farmers may face formidable difficulties. Staff are thinly spread, transport and communications may be poor, and funds are often late in arriving—sometimes by months rather than weeks. In such settings, typical of rural Africa, managerial technologies derived from commercial experience in the United States and United Kingdom are often inappropriate. It is obviously counterproductive to berate contact staff for poor management of their finances and time if none of a station's vehicles is operational and if the staff have not received a salary for three months. A basic aim of the discussion here, therefore, is to explore how personnel management must be adjusted under the harsh economic and administrative constraints often encountered in rural Africa. In particular, the analysis will focus on the interface between agency programs and farmers' needs for agricultural services. Under publicly funded systems for agricultural extension, the "bicycle man"—the agent who deals with farmers directly—is often undertrained, underpaid, and undermotivated. Yet extension workers at this level (the contact cadre) are sometimes termed the "access bureaucracy," since their performance determines the quality of service which farmers can access—and, in turn, determines farmers' opinions of the extension service as a whole.

It is now widely recognized that the contact cadre constitutes the weakest link in many of Africa's formal systems of agricultural extension. Contact workers are sometimes accused of not paying attention to farmers, of being corrupt, giving erroneous advice, or not even bothering to report for duty. Frequently ministries of agriculture have resorted to mechanistic "reforms" designed to make field staff more accountable (and thus, it is hoped, more effective in carrying out assigned duties); these reforms are discussed below. There are, however, intractable and deep-rooted conditions underlying the poor performance of contact workers in the field. Three job-related constraints typical of rural Africa will be examined in some detail: the inadequacy of many technical packages, the high degree of bureaucratization of extension, and the plain unworkability of many field assignments. I would argue that the unsatisfactory behavior so often manifested by field agents can often be explained as a rational response to remarkably difficult working conditions.

Weak Technical Packages

Probably the first requirement for the effective transfer of technology is that the innovations proposed should address farmers' perceived problems and needs. When this precondition is met, technologies will diffuse spontaneously. When it is ignored, apparently sound scientific practices may be resisted despite a great deal of promotion. This obvious point requires frequent iteration in Africa because, by and large, smallholders exercise little influence over the technological content of extension recommendations (or technical packages, as they will be termed here). Research scientists and ministries of agriculture determine which technologies will be offered to African farmers; it is a bureaucratic decision.

When salaried experts who are not themselves farmers have chosen technical recommendations, they have tended to reflect little on the screening criteria they are using. Until recently, most agronomists employed yields and returns per hectare as the chief criteria for evaluating research success, and the varieties and practices with the highest yields per hectare were almost always the ones incorporated into official recommendations. It has taken nearly a decade of lobbying by the proponents of farming systems research (FSR) to make scientists aware that farmers may have other preferences: they may want to minimize risk, to reduce the labor required at peak periods of labor demand, to avoid purchased inputs at the start of the season when money and food may be scarce, and to obtain complementary outputs (such as crop residues) required elsewhere in the farming system. None of these quite sensible and rational considerations will be taken into account when recommendations are based only on yields and returns per hectare.

A good example of the difference between researchers' and farmers' perspectives in the past is the issue of planting dates. It seemed clear in East Africa by the early 1960s that, for a range of annual crops, yields would be significantly higher if farmers planted early in each season rather than following their own planting dates. For two decades ministries of agriculture have therefore admonished farmers to plant early, irrespective of whether the field crop was maize, cotton, beans, or tobacco. Field surveys (Moris 1970; Hankins 1974) have revealed two sets of problems, however. First, how can a farmer judge in any given season when the rains have indeed commenced—since an early false start of the rains is a danger farmers recognize; and, second, how much of each crop should a farmer plant, and in which order, when the farmers' various enterprises are in strong competition for his available resources (seed, fertilizer, labor for planting and weeding, and so on)? In reality the advice to plant early, if not qualified and spelled out in detail, is at best a trivial recommendation, at worst a dangerous one.

Those who are not farming systems specialists still may find it difficult to understand how recommending

the option with the highest return per hectare can constitute bad technical advice. Research undertaken by Gathee (1982) under Kenya's Katumani Dryland Research Program, however, provides a further illustration. Kenya's Ministry of Agriculture has been relatively flexible in giving interplanted crop mixtures a place in official recommendations. The ministry's recommended package, based on intercropped maize and beans, gave the highest yield value per hectare among five options tested, at 6,132 shillings (Gathee 1982). In contrast, farmers' preferred practices yielded only 3,959 shillings per hectare—the lowest per hectare value among the five options tested. When Gathee measured the mean labor input required per hectare, however, the ministry's recommended option was found to need 325 person-days per hectare, compared with 142 for the farmers' preferred option. The ministry option also required 5,800 shillings' worth of seed (as against 3,870 shillings for the farmers' option), and returned only 5 shillings per unit of planting labor, as compared with nearly 19 shillings per unit under farmers' practices. Many Kenyan smallholders are short of both cash and labor at planting time; for them, traditional practices far outperform the ministry's recommended package. Research by Alverson (1984) on peasant farming in Botswana gives a similar result: the traditional practices provide a return per hour of labor input more than three times the ministry's "improved" recommendations.

The difficulty is that when research scientists formulated official recommendations they apparently tried to maximize the returns from the enterprises in question without paying attention to labor inputs, cash availability, or how the enterprises fitted into the larger farming system. In many instances this narrowness of perception explains farmers' rejection of officially sponsored technical packages. Pastoralists who depend on sheep, goats, and cattle for a range of consumable products have been given advice which assumed they were primarily commercial beef producers (Moris and Hatfield 1982; Behnke 1985). Efficient upland rice farmers in Sierra Leone have been told to adopt a form of wet-rice, pure-stand farming which resulted in declining yields and the rapid emergence of iron toxicity (Richards 1985). Farmers living in a drought-prone, marginal cropping area of eastern Kenya where rains are perennially uncertain have been urged to buy hybrid seeds and to plant with fertilizers (Franzel 1984). Subsistence farmers in Malawi have been told to plant high-yielding varieties of maize developed initially for large-scale, commercial farmers—although such hybrids should not be replanted as seed (as smallholders typically must do) and tend to deteriorate rapidly when stored at home as a household's food supply. It is fortunate that farmers generally perceive the shortcomings of official advice and react quickly; nonetheless, ministries and their salaried scientists will often persist in promoting unsuitable technical advice, irrespective of farmers' objections.

Inadequate technical packages undermine the influence of those who promote them in a number of ways. The negative impact of poor advice is especially pervasive when a package has been advanced to farmers under a credit program (as were most of the recommended packages just itemized). Field staff required to participate in such programs are put in a quandary. If they persuade farmers to adopt the poorly screened official packages, they will undercut their own future influence among their clients. Some are able to buy farmers' compliance by offering uncollectable loans or subsidized inputs; others, however, may feel obliged to substitute their own unofficial views or to avoid giving any specific recommendations at all. In the mid-1960s I found that junior extension staff in Kenya were reluctant to let outside experts visit their own farms (Moris 1970) because they did not themselves believe in or practice what their own ministry recommended.

The Bureaucratization of Extension

Many of the problems of African extension work arise from the way in which this function is institutionalized. Most African extension workers are government employees who are tied to sets of official duties and are part of a larger bureaucratic system. The bureaucratic realities which cause field staff the most difficulty include steep hierarchies which place contact workers at the very bottom of the pecking order; the high turnover of supervisors; the emphasis on downward communication rather than upward feedback; and the dependence on public funding at a time when many countries have instituted expenditure cuts. In general, the contact cadre's role in Africa is defined by the lines of authority and prescribed duties; it is not seen as one of giving professional advice and assistance. Not surprisingly, those assigned to work in such organizations tend to view themselves as public servants, and not as farm advisers.

The immediate concern of field staff in such systems is to placate superior officers, who are usually located in the district or provincial headquarters, at some distance from the contact agent. Field workers generally travel to the district departmental office to draw their salaries at the end of each month, but otherwise encounter higher-level officials mainly on their infrequent official field visits. Because many agricultural postings are in isolated areas, it is inevitable that con-

tact cadres will fail to meet the expectations of at least some of the various parties who make demands on them. If field workers concentrate on meeting farmers, they are likely to be away from the station when supervisors stop by (often without warning because of poor field communications). If, instead, they focus on impressing political authorities by attending meetings and assisting favored projects, their effort will remain unrecognized by most farmers and by their ministry superiors. And if they cater to their own department's requests, neither farmers nor politicians will see much of them. Because they are rated and promoted by distant, technically oriented supervisors—often on the basis of annual confidential reports—field staff have a strong incentive to respond to their superiors, but little reason to serve farmers.

Ministry officials at the national level are often eager to exercise more control over field staff, whom they describe as underemployed, unenthusiastic, and unresponsive. Seen from above, the activities of contact cadres may appear nebulous and ill-structured—a situation to be improved by imposing clearer lines of command and more detailed job specifications. This quasi-military view of organizational action completely neglects both the political imperatives which impinge on field staff and the other bureaucratic agencies with overlapping jurisdictions and tasks. Civil service procedures are usually quite specific on this point: junior staff have no authority to commit the organization to nonroutine tasks and are not supposed to initiate direct communication with outside agencies except on the most routine matters.

In reality, of course, work environments differ substantially from the orderly "top-down" world envisioned at headquarters. Smith, Lethem, and Thoolen (1980) have observed that (unlike infrastructure-oriented construction projects) rural development programs typically operate in a turbulent environment in which staff directly control only a small proportion of the activities relevant to their objectives. This is particularly so in the case of extension work. Farmers are autonomous decisionmakers who must be persuaded rather than ordered, while the organizational landscape is crowded with numerous other bureaucratic agencies pursuing their own agendas.

Farmers growing any important crop are potential recipients of an array of technical services and functions: farm planning, soil testing, applied research, certified seed, chemical inputs, land preparation, soil conservation, agricultural training, crop inspection, disease diagnosis, crop protection, postharvest processing and storage, farm record keeping, crop purchasing, seasonal credit, investment loans, and perhaps cooperative marketing. Most of these services are provided on the farm itself and need to be adjusted to each household's resources and situation. Although in Africa many such services are categorized as extension work, they relate to diverse specialties and are difficult to coordinate, even at the district level. The comparatively junior staff who interact with farmers have scant influence or authority within their own organizations, and none at all when it comes to obtaining coordinated support from other units.

Thus the conceptual advantage of treating these separate technical functions as parts of a common service delivery system is largely negated at the operational level by the compartmentalization of tasks. Even in countries which retain huge ministries of agriculture and livestock development (as at present in Kenya and Tanzania), the ministry will be subdivided internally into numerous sections and divisions. Field staff are attached to particular sections and must appeal up through several layers of the hierarchy each time a coordinated field activity is planned.

In principle a service delivery system can be organized on the basis of technical functions, a common crop, or a given territory (Moris 1981). As already indicated, many African countries possess separate field services operating on all three bases: an extension service dealing with food crops; several parastatal crop authorities supporting export crops such as coffee, tea, or tobacco; and various integrated development projects defined territorially. Although all these entities may come under the treasury or national planning body in some way, there are few linkages among them at intermediate levels. At best, such an array of service institutions constitutes what Aldrich (1977) terms a "loosely coupled system." The constituent agencies compete with each other for clientele and funds. They are unlikely to share information freely or even to adhere to commonly agreed programs.

If field staff wish to serve farmers effectively, they must find ways around this cumbersome, formal system, which inhibits rather than facilitates interorganizational cooperation. They may achieve this by an unofficial barter of services between units, by invoking the unusual personal authority of a "big man," or by a variety of other stratagems. This tendency has been called an "economy of affection," since it is based on an exchange of favors outside the formal system. What officials cannot do is to admit openly how they are acting, since their actions differ at many points from approved procedures. This makes it difficult to analyze the effectiveness of African extension on the basis of actual behavior; instead, attempts at reform have been rooted in the internalized images held by managers and consultants alike of how bureaucratic organizations *ought* to operate. Analysts drawing on classic managerial princi-

ples will find a ready response to suggestions that improved performance depends on extra training, more detailed plans, clearer tasks, and tighter controls. Since most African ministries of agriculture are undeniably poor and strongly hierarchical, their leaders often share this vision of how agency performance should be improved.

Insight into the applicability of general management theory to African agricultural extension comes from a review of ninety-four studies of third world bureaucracy done by Kiggundu and others (1983). They found that although investigators who concentrated on the internal methods of agency operation could readily apply "universal" managerial principles, those who looked instead at the relationship of individual bureaucratic units to their larger environment could not. The foregoing analysis suggests that this is precisely why standard management prescriptions produce disappointing results when applied uncritically to African extension bureaucracies.

By definition, field extension agents are primarily involved in relationships outside their own unit, dealing as the occasion demands with farmers, community leaders, commercial suppliers, local and district government, and other technical agencies. They find themselves trapped in an invidious situation in which achieving the desired results means dealing with external forces and actors in ways disallowed by their own organization. In Africa today, unfortunately, there are many incentives for hard-pressed field staff to act in ways which ultimately sabotage basic program goals. Unless such structural contradictions are removed, attempts to improve the output of contact staff by tightening internal control from above can produce unintended and counterproductive results.

Working Conditions in the Field

The resources made available to the typical extension agent in contact cadres depend greatly on the individual's rank and posting. Junior staff who happen to be attached to a large unit, such as a farmer training center or a district agricultural office, can obviously expect some assistance from higher-level staff when their assignments dovetail. Those assigned to visit farmers, however, often work in remote communities where they alone represent the agriculture department.

Sometimes field staff do not even have an office of their own and are expected to work out of their house or to use a table in the corner of a cooperative society office or chief's camp. In other instances they will be given the use of two or three rooms furnished with a table, some hard chairs, and perhaps a filing cabinet or locked cupboard containing some faded technical reports and files. Usually there is also a lockup room (or "store") containing bags of seed or fertilizer and perhaps some broken crop sprayers and spare parts. If the extension agent is lucky there may be a typewriter and secretary—even a functioning telephone. But this modest listing approaches the limits of what a field worker can expect; the larger items of equipment often seen lying about outside are generally broken down or awaiting spare parts. It is clear that the extension worker's main theater of operations is intended to be in the fields or at farmers' homes, using whatever equipment farmers themselves can provide. In practice, however, only a few of the wealthier farmers will possess the items of technology an extension worker needs for demonstrations.

The extension workers also need some means of transport in the field. Countries differ greatly in what provision is made for transport. Probably the most common is a bicycle allowance to repay the individual for wear and tear on privately owned or ministry-supplied bicycles. In Ethiopia contact staff ride mules or horses. In parts of the Sahel they tend to use lightweight mopeds, sometimes purchased under a ministry-backed loan. Only in the relatively advanced economies of southern Africa do field staff usually enjoy at least motorcycle transport. When pressed to explain *why* their ministry is so parsimonious with transport support at the contact level, officials may argue that contact workers are supposed to live with farmers and do not need better transport. They may also point out that many contact workers are untrained and were recruited for temporary assignments which did not warrant logistic support and which are due to be phased out.

There appears to be a fairly wide consensus among extension workers concerning the types of problem they encounter. Extension workers from six Nigerian states have listed their five most important difficulties in order of magnitude: insufficient transport facilities, low prices and lack of proper markets, lack of cooperation from other agencies in program implementation, lack of staff motivation, and inadequate technical training in agriculture. Tanzanian extension workers, when asked to explain their inability to give farmers the necessary training, listed among the main factors lack of transportation (51 percent), unavailability of inputs and training facilities (49 percent), lack of research and technical support (43 percent), and lack of incentives and administrative support (31 percent). The point is that most of these perceived constraints cannot be remedied by the extension worker's individual efforts; they are part of a structure in which disincentives greatly outweigh the incentives for positive action.

Consequently, field staff who must work in remote settings without adequate transport and equipment are unlikely to behave in the ways suggested by extension models derived from the experience of developed countries. Staff may choose to minimize their travel time and costs by concentrating on group meetings. They may cultivate a small, local network of compliant farmers and perhaps give them preferential access to ministry-controlled benefits (loans, inputs, and services). Or they may simply report each day to the duty station, which will at least absolve them from blame for not working. Those adopting this tactic may respond quite quickly to suggestions from above, provided they can tap accompanying resources, and may become involved in a succession of short-term campaigns (livestock censuses, fertilizer distribution, locust spraying, and the like). Finally, as already noted, there is the end-of-month trip to headquarters to submit reports and draw salaries—a routine activity which may consume an entire week in places where transport is poor.

Such tendencies are reinforced in those African systems where, as a matter of ministry policy, field staff are usually posted outside their home areas. Contact-level staff in these systems are unlikely to become a continuous source of technical information or a means of mobilizing extra resources to solve farmers' problems. To carry out either function staff would require adequate logistic support and interaction with their own supervisors—two conditions that are essential for the kind of extension work usually described in textbooks, but that are rarely encountered in Africa.

Probably the most common mode of communication in low-resource extension systems is through farmers' meetings (called *barazas* throughout much of East Africa). Barazas date back to colonial times and are highly ritualized occasions, attended mainly by older men with time to spare or unattached younger men seeking diversions. Neither group tends to carry out the tasks under discussion, which are generally the responsibility of women or hired laborers in Sub-Saharan Africa. The participants in such meetings show a polite deference to those in charge, an understandable but unfortunate reaction which deprives salaried staff from obtaining feedback about the more unpopular aspects of their technical recommendations. All in all, the typical extension meeting serves as a form of administrative theater—complete with positions of honor, a recognized and familiar litany of innovations, a hortatory mode of address, and a tacit understanding that what is discussed will generally not translate into practice. (This consensus also undermines the impact of "dialogical" approaches to extension along the lines advocated by Freire [1969] and others.)

The question of how to involve women in the contact network remains unresolved. Field research across Africa has shown a systematic bias against the inclusion of women in development projects (Dey 1984; Fortmann 1977; Paula 1978; Staudt 1978; and Swantz 1985). In East Africa it is not uncommon for more than a third of rural households to be headed by women. They usually do not enjoy access to government credit, do not attend off-farm meetings, and are not visited by male extension workers. By convention, women in many African social systems are expected to let male relatives act as "gate keepers" when dealing with outside officials. The younger, educated men who are likely to be appointed as extension staff, moreover, often differ from their potential clientele in age, experience, language, and even religion. This greatly diminishes the prospect of any effective communication of agricultural information, either from agents to farmers or vice versa (elderly women, for example, often know a great deal about certain traditional crops).

The typical reaction from ministries of agriculture has been to recruit more women into pre-service training to earn a certificate, diploma, or degree. Although this policy has increased the number of female staff, it has not brought corresponding changes among contact workers. The reasons are basically sociological and structural. Only a tiny minority of women qualify in mathematics and science at the secondary level and then complete advanced technical training. Many of them come from educated, elite families. Their male supervisors are reluctant to post such staff into difficult field assignments. Also, when these women marry (usually another government employee) any changes in assignment bring immediate problems because of the spouse's posting and other family responsibilities (Mutiso 1979). Often, therefore, women are assigned to a town where their husbands can also find work, a solution which removes dual career tensions but which also takes the woman out of contact with her rural clientele.

There are usually more untrained contact-level staff than ministry policy recognizes. Why? First, because of rigid procedures for the recruitment of permanent staff (especially in technical fields requiring pre-entry training), ministry offices commonly operate with unfilled positions. Most are permitted to add "temporary" staff as a stopgap measure while qualified personnel are being sought. Then, too, many African countries have from time to time mounted crash programs to take on large numbers of school-leavers after only brief initial training, supposedly on a temporary basis. Second, because temporary staff are not shown on the national personnel register, local offices can use them to evade manpower ceilings and staff unanticipated new programs. Third, unqualified local staff receive the very lowest salaries and, in theory at least, can be dismissed

at will if there is a budgetary shortfall. Fourth, because salaries for better-trained staff are also low, some ministries experience a high turnover among those who have earned a certificate or diploma. Having a pool of untrained but already engaged temporary workers makes it easier for a district agricultural office to operate normally despite high rates of staff turnover. For extension workers, of course, a "temporary" job is better than no job at all.

The chronically low morale among the contact cadres is best explained by the tendency of individuals to evaluate their own career in comparison with that of others from the same secondary school cohort or the same environment. Unlike their classmates, extension workers at the contact level are often those who failed academic examinations (perhaps in key subjects such as mathematics or science). They are chosen for ministry employment without consideration of their aptitudes or personal interest, and they may view a field assignment as a temporary setback, to be borne while searching for some way to obtain an urban posting or to re-enter the education system. Unlike workers in the four other government services typically found in rural communities—education, health, police, and administration—extension staff must work highly irregular hours and are generally required to move about the countryside without receiving any extra compensation. Primary school teachers, for example, who perhaps have less education than extension workers, are usually provided with housing and work regular hours. Sometimes, as a consequence, it is the more educated field staff who have the lowest morale, since for them the relative deprivation is the greatest.

Unfortunately, the causes of poor performance are most evident in places where extension work is most difficult—in remote areas and in connection with crops that are not well serviced. Shortages of transport, technical information, and trained staff have continued unremedied for more than two decades in many such places. This situation indicates that basic structural features which transcend fluctuations in ministry policy and program content are the issue.

Since the mid-1970s resource constraints have tightened in many African countries. Ministries have less margin for discretionary expenditure because of the increased proportion of the recurrent budget committed in advance to salaries. Headquarters display symptoms of organizational atrophy: abandoned vehicles await spare parts, light bulbs are missing, journals have been discontinued, and reagent bottles stand empty. Some field personnel, however, have suffered much more severe privations. Fuel rationing leaves barely enough gasoline for a journey to headquarters and back each month. The supplies of inputs available legally have dried up, making a mockery of extension advice which instructs farmers to apply fertilizers or to use sprays. Even spare bicycle tires and tubes, so essential for visiting farmers, may be unavailable. In some countries defaults on crop payments to farmers and on salary payments to field staff are common and further break down the resource structure in which extension must operate.

Reforming African Extension

The preceding analysis refers principally to public sector extension systems in countries suffering severe financial crisis. The dilemma of how to improve or simply maintain services with diminished resources is common to many African countries, but especially those with a large extension service and declining export crop earnings. Many East and Southern African countries fit this description. With large field establishments in place, few are willing to scale down public sector extension rapidly or, for that matter, to privatize it. Instead, their leaders continue to search for more cost-effective approaches to extension which can be adopted within the current parameters of the agency. The above analysis of constraints at the field level offers several insights into why past and present reform measures remain relatively ineffective.

In the 1960s the concentration of technical assistance on extension methods (much of it funded by the U.S. government) had little impact. Adequate technical packages did not yet exist, and the few on-farm demonstrations that took place probably reinforced farmers' skepticism about ministry recommendations. More generally, when a system as a whole begins to malfunction, interventions which focus on only one component are doomed to failure. Even if there is a localized improvement, it will be masked by adverse trends rooted in the larger environment.

During the 1970s the emphasis on nonformal education, technical packages, and integrated rural development projects was also ineffective. In most cases, these new emphases were implemented outside of the ministry of agriculture's main structure by means of loosely attached "enclave" projects. They had their own project management units, which focused primarily on financial control. After much experimentation many of these projects did achieve unified budgeting systems, but this was often the only integrated aspect of their operations. A tightly administered project that by definition cut across normal ministerial and agency lines became an empire accountable only to itself. Such projects usually enjoyed far more resources (staff, training, vehicles, and recurrent funding) than the parent agencies could

afford. Once external funding ceased, the project's privileged resources were soon dispersed to meet other needs within the larger system, and its impact melted away. Alternatively, if project managers attempted to work within the existing system, they soon discovered there were no effective devices for coordinated implementation. Each ministry or agency continued with its own programs, and it was rare to find actual integration of activities in the field. Furthermore, it was assumed that officially recommended technical packages were sound, although this was not always the case. Under risky conditions and with an inadequate supply of inputs farmers did not reap the anticipated profits, and loans were not repaid. Even the nonformal emphasis, which had seemed so attractive in theory, ran afoul of the ritualized character of farmers' meetings. Most integrated rural development projects are today regarded as failures.

The standard format of aid agency projects appears to have contributed to the difficulties. Extension functions are not easily measured as "outputs," and it is even harder to specify what "inputs" will be needed to perform them. The project cycle as usually implemented leaves no room for an extended period of organizational learning—a point emphasized in Korten's (1980) concept of the three sequential learning processes which characterize successful programs: learning what to do, learning how to make it cost-effective, and learning how to replicate it. Project designers often work outside the system being "assisted"; they prepare a plan of action which others will implement. In Africa project planners have often incorporated unrealistic deadlines into the plan. It usually takes from two to three years to recruit and install the field team, by which time they may be facing a midproject evaluation and be expected to have shown tangible results. Again and again, one finds that the extension phase slips toward the end of the project life and then becomes overtaken by pressures to show an observable output. In many cases, the extension component of a rural development project never becomes fully operational before outside assistance is terminated.

In the 1970s most African ministries of agriculture lacked convincing arguments to justify requests for funds to upgrade extension. A plethora of concepts and approaches competed for attention: appropriate technology, high-yielding varieties, nonformal education, functional literacy, women's groups, on-farm water management, social forestry, and farm service centers represent only a handful of the fifty or more types of rural development interventions being proposed (Moris 1981). Since each external funding agency generally wanted its own discrete projects, each section of a ministry became engaged in trying to identify interventions which were fashionable with particular donors. In this race to garner funding, ministries of agriculture had few new extension ideas and even fewer solid achievements to parade. They merely relied on the unconvincing argument that a public extension service was a good and necessary part of the rural development process.

At the same time, ministries of agriculture found that their field resources were becoming stretched ever more thinly as they struggled to replicate the territorial hierarchy of the general administration. The budgetary crisis of the late 1970s and early 1980s cut them off from vital recurrent funds and did not allow them to replace vehicles. Morale among the field cadres deteriorated just when farmers had the greatest incentive to switch from the export crops on which national economic survival depended. Senior ministry officials talked about greater discipline and closer accountability within the extension service but were not able to offer positive incentives to stimulate higher levels of productivity. In short, by the mid-1980s an untenable situation had developed in which overstaffed and underbudgeted ministries of agriculture were demanding higher output from an already demoralized field service.

Into this depressing context, external funding agencies have introduced two major innovations: farming systems research (FSR, initially sponsored by the U.S. Agency for International Development) and the training and visit extension system (T&V, sponsored by the World Bank). The following discussion will concentrate on how these innovations have influenced or might influence the effectiveness of the contact cadre of extension. Although ministries of agriculture welcomed both innovations, they did not necessarily approve of the systems as such; FSR and T&V obviously represented a means of securing external resources—the vehicles, hard currency, and external training which were sorely missed by senior agricultural staff. Whether or not local officials were committed to either innovation, they did need the resources which accompany most large technical assistance projects. FSR and T&V have therefore emerged as the main extension systems of the 1980s in tropical Africa.

Farming Systems Research

By the early 1970s, obvious faults within station-based research recommendations were recognized, if not by natural scientists then at least by agricultural economists (Belshaw and Hall 1972). It had become clear to them that a whole-farm perspective was essential when reviewing options for farming enterprises. The varying resources commanded by farmers and their perceived

constraints and problems needed to be recognized and accounted for in the generation of technology. Collinson and Ruthenberg in East Africa and Norman in West Africa gradually evolved a new approach to on-farm, adaptive research, now generally known by its American title of farming systems research.[1]

From the earlier discussion of weak technical packages, it should be obvious that FSR constituted a much needed modification to the way in which ministries of agriculture derived their technical recommendations. Virtually all East African countries have now implemented FSR projects in one form or another. The common elements within this approach have been the whole-farm perspective, identification of immediate bottlenecks as perceived by farmers, use of a multidisciplinary investigative team, willingness to employ rapid reconnaissance methods, the identification of recommendation domains, and a stratification of packages to suit varying resource and managerial levels. Few projects have yet reached the stage where all of this has been accomplished, since farming systems have proven to be far more complex than outsiders had generally assumed. In addition, when a broad range of considerations is taken into account, farmers' existing techniques have proven to be equal or superior to officially recommended practices. In this sense, FSR has had a greater educational impact on research scientists—by providing them a methodology for evaluating their screening criteria—than it has upon African farmers.

Initially, FSR experienced operational difficulties when attempting to transfer its results into extension practice. FSR units, although based in the research system, require continual access to farmers in different zones because on-farm adaptive trials must be carefully planned and closely supervised. To achieve the necessary liaison and quality control under African field conditions requires local staff with substantial logistic support, normally beyond what research stations can provide from their own resources. Thus, although extensionists initially had little involvement in FSR projects, they soon were requested to release field staff to assist with FSR surveys and trials. At this point it became apparent that FSR had no clear methodology for incorporating its research results into the extension system. This was a serious omission, and one which explains why in some quarters the approach is now termed FSR/E (farming systems research and extension).

The outdated and hierarchical modes of official communication used by ministries of agriculture were one obstacle to the dissemination of FSR results. Research stations traditionally issue annual reports, which are then reviewed by the extension service, handed over to the audiovisual section, and eventually issued in the form of pamphlets and recommendations to the field service. Direct two-way linkages on a zonal basis between researchers and district extension staff seemed to violate the orderly—but excruciatingly slow—process of producing official technical packages. Furthermore, the organization of FSR teams into units located at a specific research station often left them under the control of the station director, who might deny them the right to initiate direct contact with extension staff.

Regional offices were set up on both sides of the continent to support the introduction of the FSR approach in a number of countries, giving training and working with a broad cross section of ministry staff. A major uncertainty concerned the way in which FSR should be coordinated with a simultaneous innovation, the World Bank's T&V system. After 1980, senior extension officials in several countries began to adapt the T&V system as developed in India to suit their own rather different circumstances. Some found the apparent lack of any relationship between FSR and T&V confusing.

To resolve implementation problems, the regional FSR support groups organized a series of regional and national seminars, and external agencies and foundations entered the scene. By mid-1985 most ministries of agriculture had become reconciled to integrating both approaches into a common research-extension system. It seemed obvious by then that the regular training sessions at the core of the T&V system presuppose continuing access to field-tested innovations—precisely the output FSR was supposed to generate.

Although it is too early to describe how FSR (or FSR/E) will become permanently institutionalized, one can recognize the potential benefits of the FSR perspective for field staff. First, it offers a methodology for bringing disciplines other than agronomy into the research process. Second, it specifically recognizes variability and abandons the counterproductive efforts of ministries to arrive at nationally uniform technical packages. Third, it obliges researchers to work with extension staff, preferably as partners rather than rivals. Fourth, it takes farmers' perceived constraints and technical knowledge seriously, for the first time opening a channel for direct feedback from the grass roots. Fifth, the stratification of results to suit varying resource levels and managerial competencies now allows these variations to be directly addressed by the extension service. These attributes represent a significant improvement over the earlier system of station-derived research results.

The T&V System

The training and visit system came to East Africa under World Bank sponsorship, after its earlier successes in

Turkey, India, and Southeast Asia. As developed by Daniel Benor, T&V consists of a package of organizational measures which enable a ministry of agriculture to tighten its procedures and to intensify the delivery of technological information to farmers. This latter function is seen as the main purpose of agricultural extension. T&V advocates a return to classic management principles: a functional delegation of tasks, clear reporting lines, reasonable spans of control, regularized and frequent training seminars coordinated with a scheduled cycle of farm visits by extension staff, and a work program mutually agreed between field staff and their supervisors. These changes not only allow farmers to know when and where they will be visited, but also facilitate supervision of the contact cadre's activities. Another key feature of T&V is Benor's insistence that the extension service should not assume responsibilities for which it is not suited, such as input delivery, credit supervision, or community development.[2]

The T&V system in India appears to have been quite successful, and the basic similarity of many African administrative systems to the Indian one suggested that T&V could be directly applied in Africa. Those of us working on agricultural extension in East Africa, however, had doubts about the suitability of T&V under African field conditions. In India T&V could draw on a decade of research on high-yielding varieties, an extensive irrigation network, and efficient and ubiquitous input delivery systems. The main crops, wheat and rice, were already popular among farmers, who had begun to specialize as commercial producers. They had access to credit, and prices were generally adequate. Furthermore, they lived in compact villages where it was easy to make visits on schedule, and they were served by a relatively efficient administrative system.

By way of contrast, for most of Africa suitable technical packages have not yet been developed. The extension service deals with scattered and sometimes inaccessible farmers who grow a multiplicity of annual and perennial crops. Commercial input suppliers are often unreliable, and farm prices are frequently distorted to protect urban consumers. The lack of irrigation means that production is highly seasonal and risky, with great variations among areas, which makes it very difficult to recommend optimal combinations of recommendations for farming enterprises. And, as we have seen, administrative systems are often flawed. These differences argued against a direct transfer of the Indian version of T&V into Africa.

Now that the first generation of T&V projects has been established in various parts of East and Southern Africa (notably in Kenya, but also in Botswana, Ethiopia, Malawi, Somalia, Sudan, Zambia, and Zimbabwe), there is a widening base of local experience to draw on. The introduction of T&V has provided ministries of agriculture with an opportunity to dramatize their needs. In particular, Daniel Benor's international standing has guaranteed attention and support from the highest levels of government. An example would be Kenya, where Leonard (1977) conducted a classic study of field extension. Though eminently sound, Leonard's recommendations did not provide the ministry with sufficient authority to gain Treasury support; it was Benor's advocacy which finally obtained a national commitment to extension reform.

The Kenya case (generally regarded as the T&V system's most successful African project) has other lessons to teach. The National Maize Program had already devoted two decades to developing several types of hybrid and synthetic maize, differentiated by maturation time and altitudinal zone. In the heartland of the country, where the agricultural potential is greatest, the extension service had been densely staffed since the mid-1970s (Leonard 1977; Almy 1974). A wealth of agricultural research institutes provided a large cadre of scientists able to serve as potential subject matter specialists for training contact staff; an underutilized agricultural information center also existed as did several agricultural colleges. Commercial suppliers provided high-quality seed and inputs, while the transport system and infrastructure were excellent. Maize is the staple crop, grown by nearly all the small farmers. And, perhaps most important, Kenya has stressed administrative efficiency within its agricultural services. Where similar conditions pertained, as in Botswana, Ethiopia, central Malawi, and Zimbabwe, the T&V system was capable of being implemented successfully with only minor changes from the Indian model.

Even in Kenya, though, there have been unanticipated pressures. Some agencies resisted when requested to release staff to serve as subject matter specialists. Although the initial training sessions relied on the large stock of existing technology and accompanying extension materials, new emphases needed to be incorporated later. They required an array of specialists to liaise with FSR staff on the content of training programs, to design new audiovisual modules, and to conduct the orientation and training of trainers. When in full operation, a biweekly cycle of training seminars implemented nationally generates an enormous demand for fresh material and requires sophisticated and coordinated support from the parent ministry. Before the adoption of T&V, research stations were not held accountable for the regular delivery of field-tested recommendations. Now if technical packages are nonexistent or unsuitable, agricultural scientists may come under

criticism from an extension service that depends on their timely input into the training cycle.

In countries or in areas with few resources for extension or with dispersed populations, the T&V system has been specifically adapted to the local situation. Training sessions have been put at the end of each month, when field staff must come to the administrative center in any case. Visits to farmers have been addressed to groups rather than individuals, so as to retain the advantage of a known schedule but expand the number contacted. Certain days of the month have been reserved for women's clubs or youth work (two groups which tend to get left out in the standard T&V approach). These changes attenuate the intensity of extension contact, but they do retain Benor's central concept of coupling regularized training with a reasonable and verifiable work load for the field agent.

Benor cannot be omnipresent; countries must assume increasing responsibility for sustaining a viable program themselves. In some ministries of agriculture, middle-level staff have failed to plan training sessions and have shown themselves unwilling to release the transport and financial resources T&V requires. Others have tried to use the top-down orientation of T&V to "ambush" junior officers who might be caught away from their post. The danger is clear: unless a ministry is willing to address the causes of poor morale which are rooted in the larger administrative and political system, the imposition of a rigid and demanding field schedule may instead increase the already high levels of frustration among front-line extension workers.

Conclusion

Neither FSR nor T&V encompasses all aspects of the technology diffusion process. I have argued that they are complementary to each other and should be seen as interrelated components of a larger system for generating and conveying agricultural innovations. If effectively implemented, they promise a number of benefits for field staff. Having technical packages which really do address farmers' concerns will free extension workers from having to disguise or sugarcoat ministry recommendations. Having a realistic work load and regular contact with supervisors and trainers is also highly desirable. Adoption of T&V can safeguard contact staff from unrealistic work demands, always a possibility when the extension service tries to match the territorial hierarchy in the general administration. T&V's insistence on not saddling front-line workers with loan collections or time-consuming field surveys is also welcome.

Notes

1. Early sources on FSR in an African context included Anthony and others (1979), Gilbert and others (1980), Norman (1980), Ruthenberg (1976), and Shaner and others (1981).

2. The system has been well described in the literature, for example by Benor, Harrison, and Baxter (1984) and Benor and Baxter (1984). Independent assessments are available in Howell (1983, 1984a), von Blanckenburg (1982), and Moris (1983a and b).

13

Public Investment in Africa's Extension Services

John Howell

Public expenditure on Africa's agricultural extension services has followed an uneven path. After a period of high spending in the 1960s, the level of allocations in most countries fell in relation to other areas of agricultural investment, and in the 1980s it has taken a major effort by external funding agencies to restore extension to some importance in public spending. The factors which led to a loss of confidence in extension services are examined here, as well as the extent to which these factors have been addressed in the current renewal of public investment in extension.

Trends in Expenditure

Compared with the rest of the world, Africa has invested substantially in agricultural extension. If expenditure on extension is expressed as a percentage of the domestic value of agricultural product (DVAP), Africa appears as the continent most committed to agricultural improvement through publicly provided advisory services and technical support (see table 13-1).

Table 13-1. *Expenditure for Agricultural Extension in Selected Regions, 1980*

Region	*Percent*[a]	*Millions of U.S. dollars*
North Africa	1.71	173
West Africa	1.28	205
East Africa	1.16	106
East Asia	0.85	241
Northern Europe	0.84	201
North America	0.56	634
Southern Africa	0.46	31
South Asia	0.20	82

a. Expenditure as a percentage of domestic value of agricultural product.

Source: Judd, Boyce, and Evenson, "Investing in Agricultural Supply," Economic Growth Center Paper 442, Yale University, 1983.

Table 13-2. *African Expenditure on Research and Extension, 1959–80*
(millions of 1980 U.S. dollars)

	1959	*1970*	*1980*
Research	119	252	425
Extension	238	481	515

Source: Same as table 13-1.

If these figures for expenditure are traced back over twenty years, however, it is evident that the major increases came in the 1960s, immediately after independence. Since 1970, investments in extension in relation to DVAP have fallen sharply in North and Southern Africa and have risen significantly only in Eastern Africa. In absolute terms (1980 U.S. dollars) Africa's investment in agricultural extension has barely risen since 1970, while that of Asia and Latin America has registered substantial increases (Evenson 1986).

Another indicator of the changing emphasis on extension investment can be seen by comparing spending priorities within the public agricultural sector. Research is the other main consumer of funds, and the evidence suggests an even pattern of growth amounting to a tripling of real expenditure on African agricultural research over the twenty years to 1980 (see table 13-2). Africa's spending on research was 85 percent of its spending on extension in 1980; in 1959 research spending was only 50 percent of extension spending.

This decline in the importance of extension is only partly the result of new public expenditure priorities, however. More important, and contributing to resource allocation decisions, has been the declining effective-

ness of the extension services in question. This is impossible to quantify regionally, although the weight of individual assessments of systems conducted in the 1980s is difficult to contradict. In country after country the view of external funding agencies and ministry of agriculture officials was that extension services failed to support farmers adequately and that their staffs were deficient in technical knowledge, lacked the facilities they required, and were left unsupervised and erratically guided by their ministries (Chapman 1987).

It is now generally agreed that corrective action should consist of increased investment in extension (particularly in recurrent costs) linked to reforms in management and training. The World Bank, in particular, has taken the lead in this new emphasis on extension. There are now few African countries not in receipt of external assistance in support of some national program to improve extension, normally based on a better-trained, better-supervised, and more mobile field service.

This recent shift into extension investment was led by the Nigerian government, which used World Bank loans to instigate a series of projects for extension, credit, and input supply in the early 1970s. In the 1980s governments in Eastern and Central Africa have begun to use loans and grants to support extension-specific projects, often employing the training and visit approach. By 1985 the World Bank alone was financing more than fifty projects in Sub-Saharan Africa that contained a substantial extension component, with bilateral donors such as the Overseas Development Administration (ODA) and the U.S. Agency for International Development (USAID) often providing parallel grant support.

The long-term positive impact of this new level of public investment, however, will depend on the extent to which extension services can overcome the difficulties that have characterized their performance to date and that led to their neglect in the 1970s. The most important of these difficulties are the inadequacy of the technical and economic research required to complement the extension effort, the weaknesses in the organization of technical support services and input supplies, disregard of the cost and financing issues surrounding extension and other farm support services, and inattention to the need for systematic, professional management and training of field staff. These are discussed in turn.

Research and Extension

Extension work in Africa has suffered from the poor performance of research and, in particular, from the unsuitability of recommendations to most small-farm situations. This is not simply the familiar problem of the lack of technical breakthroughs in Africa of the sort achieved in South Asia and elsewhere. It also reflects the remoteness of agricultural research station work from activities at the field level.

Even in countries where good research work has been done—on agronomic practices in mixed cropping, for example—there are problems of communicating research results. Research bulletins have become irregular or have even stopped in some countries; crop handbooks have not been updated; and an unacceptable number of field trials have been lost. In the latter case, spending for research station work may have been cut arbitrarily or the inflexibility of spending may have prevented, for instance, the recruitment of casual labor for trials or restricted the use of fuel needed to visit remote trials. In the southern regions of Tanzania, 75 percent of the established on-farm sorghum variety and fertilizer trials in the 1984–85 season were lost; agricultural advisers in Mtwara and Lindi regional governments attributed this loss to the problem of transporting suitably qualified agronomists to trial sites.

These resource and organizational problems apart, the research challenge itself has often proved too formidable for existing research establishments. Attempts to develop new varieties and practices that outperform those already used in peasant agriculture have fallen short of meeting the complexity of farming in risk-prone and resource-scarce production systems. Occasionally researchers and extensionists have found that a simple recommendation is valid and acceptable—such as replacing a disease-prone cotton variety with a less susceptible one, as in Malawi. But more often the small farmer must take account of a range of characteristics other than the technical criteria of yield and disease resistance. They include storage, labor requirements, timing of planting and cultural operations in relation to other crops, reliability of inputs, and palatability. It is this range of considerations that makes peasant agricultural development such a challenge to research scientists. Conversely, the lack of understanding of rural household systems has diminished the performance of crop research and has severely inhibited research involving the relationship between crops, animals, trees, and land within those systems.

The weakest link in extension organization in most African countries is the generation of useful information on farm operations and the transfer of this information through the extension service to the research station. The regular meetings and training days which are a feature of recent extension investment have the potential for rectifying this weakness, but the evidence on performance suggests that feedback remains inade-

quate. Successful research efforts in Africa are likely to require the help of extension staff in generating information on existing practices and on how they should influence research design and recommendations.

In Zambia, for example, Sutherland (1986) reports much closer support from the research branch to extension services since the inception of an Adaptive Research Planning Team by the Ministry of Agriculture and Water Development. But he also notes the continuing failure of the extension agents to report systematically on farmers' agronomic problems. In a striking example from Zimbabwe, Cousins (1986) reports on a plowing method developed with farmers by local extension staff outside the formal research system and thus only recently subject to replication trials elsewhere.

The CIMMYT-supported farming systems work in Zambia, Zimbabwe, and other Eastern African countries is helping to address the structural gap between research and extension. But professional attitudes are not easily altered. Research staff are not often interested in supporting extension if this involves additional and unfamiliar work. Yet with extension organized as it currently is, research staff rarely receive much benefit from closer collaboration with extension staff.

Within training and visit systems, a period in the training day is normally devoted to reporting problems. In practice, however, this often results in a recitation of the difficulties involved in recommending—or gaining acceptance for—improved varieties and practices discussed previously. In my own experience, there appears to be little discussion of the reasons why farmers have not adopted the recommendation or followed other advice. One way of strengthening this aspect of extension work is to encourage reporting on the impact of extension—to put a premium on diagnosing reasons for nonadoption, or perhaps adaptation, by farmers. Particularly where understanding of farm problems is poor, extension reporting of this sort can contribute significantly to the design of research, although there are real difficulties in aggregating and using the necessarily anecdotal information that comes from extension meetings (Howell 1984a).

It is axiomatic that successful extension requires the existence of technologies to extend. Given the generally poor performance of agricultural research in Africa, therefore, the case for public investment in extension might appear to be weak. One common argument against it turns on the premise that effective extension must be "demand led"—in other words, farmers must already be looking for opportunities to plant new varieties or to use new technologies before they will have any interest in what extension can offer. This readiness to adopt will come primarily when ordinary farmers observe the experiences of the more innovative farmers; therefore, the argument runs, until African research stations have produced a stock of technologies that will attract this group of "leading" farmers, there will not be enough demand for technical advisory services to justify a major investment in extension.

But this argument—and its counterargument—is somewhat academic. There has been endless debate, for example, over whether the widespread adoption of hybrid maize varieties in Kenya and Zimbabwe was led by an extension service confident in its recommendations or by farmer-to-farmer contact. Similarly, it can be argued that the introduction of smallholder crops such as tea and cotton in Eastern Africa in the 1940s and 1950s was the result of well-organized extension efforts and would not have taken place merely by farmers responding to market opportunities. The contrary has also been argued.

Technical Support for Extension and Input Supply

Of more merit than the foregoing argument, however, is the truism that extension services are unlikely to be of value to farmers unless they are buttressed by a range of specialist advisory services and by government support for input supply services. In practice, extension services often lack such a support system. Within the extension services themselves professional expertise is usually weak. This is largely because ministries of agriculture expanded rapidly after independence, which meant that many of the best agricultural staff were removed from direct field work and promoted into administrative positions or transferred to crop authorities or specialized services (such as horticulture or plant protection). The general field services of ministries of agriculture therefore became—and remain—relatively low-status sections of institutions dominated by specialist services and planners.

The unavailability of inputs often impedes the effectiveness of extension services. In most African countries rural producers cannot count on the private sector to supply their needs. Private involvement is largely confined to marketing output; there are few private suppliers of seed and fertilizer, and private credit is largely restricted to informal mechanisms that are unable to meet the demands of large numbers of farmers for highly risky seasonal crop loans. As a consequence, extension staff are frequently engaged, as agents of public sector organizations, in distributing inputs and disbursing and recovering loans. Where such mechanisms are operating effectively (as in Malawi, where the parastatal ADMARC supplies fertilizer and credit), they can prove to be highly supportive of the technical advisory work of extension staff. Where the mechanisms are

deficient (as in Tanzania, where planting materials are supplied through TANSEED), extension staff are severely hampered. The availability of certified seed, fertilizer, and services for plant protection is of course vital to crop extension work. Even when these inputs are available, however, their effective distribution and utilization requires the involvement of adequate numbers of specialist staff—at least until the public sector ceases to be the dominant channel of supply.

For most African countries, the biggest single organizational constraint to running an effective extension system is the difficulty of establishing a referral and support system within the extension service. Of particular difficulty is staffing the technical posts of subject matter specialists (SMS) at the district level. It is simple enough to designate some underused diplomate in the district office as the "agricultural engineering specialist." It is another matter for him to act convincingly in that capacity. Developing a cadre of SMS with the combination of training ability and research experience (or sufficient familiarity with research work to refer problems and information to the appropriate place) is a long-term exercise. Even in a relatively well-endowed country such as Kenya, there are significant difficulties in recruiting specialists (in horticulture and crop protection, for example) to work at the district level and below (Kenya, Ministry of Agriculture and Land Development 1984).

The preparation and appraisal of extension projects do not always take into account the difficulties in building up the SMS cadre. The present low number of SMS posts in most African countries implies that this area of investment is neglected because of high recurrent costs. In Africa this is probably the factor which most severely limits the development of training and visit forms of extension. World Bank staff developing a pilot T&V project in Ethiopia in the early 1980s, for example, identified the lack of SMS and the long lead time required for their development as the critical obstacles to the rapid replication of what had proved to be a highly successful experiment.

Financing Extension

A major question mark hangs over the current set of World Bank–assisted extension projects in Africa. This relates to the high level of long-term incremental costs implicit in these projects. In the earlier generation of Bank-financed extension projects in Asia, the incremental cost was generally less of an issue: there were already in existence large research and extension infrastructures, with well-developed systems of administrative support. Extension investment in Asia was generally concerned with ensuring better utilization of existing staff and physical facilities—not with building up staff structures and facilities virtually from scratch, as in much of Africa. If Asian models are to be followed in Africa, priority will need to be given to increasing substantially the level of staffing both in the field and at the supervisory level. It will also mean an increase in research expenditure for work at research stations and on adaptive trials. The establishment of effective research, extension, and field trials involves a certain amount of capital outlay, but even more significant are commitments to recurrent costs. This necessarily means that in the long term governments, rather than donors, will have to shoulder an increasing share of the costs.

The financing of extension services raises two sets of issues: first, the acquisition of funds within the national budgetary allocation process; and second, either the generation of funds from users or the reduction of costs in order to expand or maintain the extension services within a given government budget.

African extension officials at the African Workshop on Extension and Research held in Eldoret, Kenya, in 1984 reported a mixed record in obtaining their requested budgetary allocations. Strong planning departments within ministries of agriculture appear to be important, as success in obtaining funds is clearly related to the ability to defend in detail one's estimates and to the strength with which such estimates are pressed. This is hardly surprising. Of greater interest is the problem faced by ministries of agriculture in pressing for recurrent funds when donor finance has previously been available for extension but no longer is. Incremental posts, allowances, and operating costs covered under the externally financed development (or capital) account during the early phases of extension projects are only with reluctance transferred by ministries of finance to the recurrent (or revenue) account once external support ends. Most funding agencies (especially bilateral donors), however, are reluctant to finance local recurrent costs and normally look for a fairly rapid transfer of recurrent extension costs to the aid recipient—often making this a condition of investment (as in Malawi's National Rural Development Program, for instance). These somewhat conflicting tendencies often mean that extension will be seriously underfunded after the initial development phase.

The same officials also reported a range of difficulties in the management of extension finances already approved. During times of budgetary stringency, operating costs were either cut severely or released so slowly that extension activities came to a virtual standstill. This gave the public the impression of an inefficient ministry of agriculture unable to meet its responsibili-

ties to farmers. Moreover, adjusting to these exigencies is no simple task for a ministry of agriculture. In such circumstances it cannot easily reduce staff to match the operating funds available—and conversely, unless staff numbers are increased, the ministry often cannot argue for an increase in operating funds. Interestingly, officials of several countries at the Eldoret workshop felt that the substantial understaffing of their extension services was a more serious problem than the underutilization of existing staff.

Whether or not to generate funds from the farm sector to finance extension and other agricultural services has been an issue in Africa from the colonial period, when crop taxes were earmarked for research and extension investment. There is also a long record of levying user fees, particularly for private goods such as animal treatments or tractor rental. Although charges for public goods such as research or soil conservation cannot usually be transferred to the ultimate users, there is clearly some scope for charging farmers for specific extension services (such as soil testing) or for individual farm visits.

Experience in levying charges on animal health and artificial insemination services, however, has shown how difficult it is to assess and collect such charges in the traditional sector (Ramakrishnan 1985). Quite apart from the practicalities, there is the fundamental economic issue of whether charges should be levied in the first place—and if so, to what extent. Should they be sufficient to cover the full costs of specific products and their provision, or is it desirable that a proportion of costs continue to be paid by the government?

Despite such questions, at least some of the activities which come under the heading of extension in some countries (such as pest control and seed inspection) can be considered for charging or (in cases where charges are already levied) for charging at a full economic rate. As shown in Nigeria's Kano State, some input supply services can be transferred to government agencies that are more commercially oriented than the extension service. The transfer of entire services to cooperatives or the private sector is another possibility, although cooperatives undertaking extension-type work (such as quality control and loan administration) have usually required government subsidies, and in most countries the private sector option is restricted to a narrow range of services such as veterinary care or to extension for specific high-value crops.

The least promising possibility of all appears to be to transfer some or all of the salary costs of extension agents to the farmers themselves. In Tanzania, for example, an experimental village-employed *bwana shamba* scheme has proven unsuccessful despite the presence of village development committees to collect contributions (Howell 1985). In addition to the practical difficulties of administering charges for extension in Africa, it would clearly be undesirable to encourage such a system where smallholder production is depressed by excessive taxation of the agriculture sector as a result of unfavorable terms of trade established by government fiat.

If one agrees with this somewhat pessimistic view of the prospects for generating substantial new sources of revenue for extension, then it is clear that most governments are faced with the need to invest their scarce financial resources cautiously. An important principle adopted in many current projects is to assign priorities to certain geographical areas rather than to attempt programs for the nation as a whole. Some governments (Kenya is an example) have used proven technical potential as the criterion and have concentrated expenditure initially on areas with high rainfall. The problem with this option is that in areas with low agricultural productivity extension may have the greatest impact, but these areas would be deprived of staff in favor of others that are already relatively well supplied with extension services. But governments opting to give priority to disadvantaged areas (Tanzania and Ghana are examples) have achieved, in the short run at least, a poor return on their investments.

Managing Field Staff

The fourth difficulty associated with extension investment is that of increasing the productivity of field staff. To achieve this, stronger management and staff training programs have recently been introduced, usually along T&V lines.

In any system of structured management in Africa the sheer paucity of physical and trained human resources usually presents a problem. In Tanzania, for example, much of the extension service was immobilized in the early 1980s merely by a lack of bicycle tires. In almost all countries several days at a time can be lost when meetings at headquarters are canceled—because there is no way of communicating this to remote field agents. A crucial management tool in extension, the telephone, is a rare commodity in much of rural Africa.

Even so obviously desirable a measure as holding regular technical meetings for extension agents is difficult to arrange. Research staff and SMS are scattered and rarely very mobile; instructional material is difficult to have prepared; overnight allowances are not available to pay extension agents traveling long distances; meals must be arranged, and so on. In short, simply setting up meetings on a regular basis across the

country can involve major administrative effort and cost.

But despite such obstacles to effective management, it is evident that new levels of investment in African extension do have to be accompanied by changes in organization and in the approach to supervision. This has been the thrust of recent World Bank support in the guise of the training and visit system. The main principles of the system are difficult to contest. The emphasis on control, however, is uncomfortably consistent with the prevailing bureaucratic and hierarchical style prevalent in most ministries. Rigidly applied, the system can stifle local extension initiative. Nonetheless, this new approach to extension management has brought attention to three critical changes needed: focusing the efforts of extension staff on production matters, orienting the work more toward the field, and introducing regular instruction (Howell 1984a).

A feature of the 1960s and 1970s was the growing use of the extension worker as a general-purpose functionary of the ministry to help with production schemes, data collection, the grading of crops, and so on. In some countries attention to crop extension work was further undermined by the amount of nonagricultural work that was imposed on the extension agent. This work might involve anything from the organization of political campaigns to fulfilling routine administrative functions for other government departments. Another trend has been the proliferation of special campaigns, such as the organization of credit for the distribution of fertilizer. All of these pressures on extension staff have inevitably deflected them from the job of developing a system to provide regular technical advice to farmers. It is impractical to suggest that the role of ministries of agriculture should be redefined to concentrate wholly on technical production matters—but the responsibilities of field staff should at least be those of the ministry itself. When extension staff are at the beck and call of several ministries or regional authorities their ineffectiveness is usually guaranteed, as has now been recognized in Tanzania, for example.

Orderly extension appears to require the establishment of a fixed schedule of visits to selected farmers by extension agents. For most African countries, the individual farm visit remains the primary method of conveying information and of obtaining information on farmers' requirements. The use of mass media, local displays, demonstration plots, group visits, and group meetings are auxiliary to face-to-face work with selected farmers. Because such work should normally take place during the growing season, and since farmers need to have advance knowledge of visits, the work program should be scheduled at regular, announced intervals. This also facilitates the supervision of staff and gives to farmers not selected for individual visits the prospect of access to the extension agent.

A third contributor to effective extension has been regular meetings of groups of extension agents operating in similar agricultural environments, led by supervising officers and specialist staff. Under most T&V-style programs these meetings are devoted primarily to instruction. SMS and extension officers focus on teaching the series of practices that agents are to recommend for various crops in the forthcoming period. Despite the limitations of this approach in complex production environments, it is clearly an advance over holding meetings on an ad hoc basis to discuss administrative and salary matters alone. Like the narrowing of extension duties and the introduction of scheduled visits, regular technical meetings have been an essential ingredient in the improvement of extension work in Africa.

It must be recognized, however, that the caliber of field staff is generally poor and that farmers lack confidence in the technical and diagnostic abilities of extension staff. In few countries has the majority of field staff achieved a good standard of secondary education and completed two years of advanced training, and few countries can afford to reach this level of basic training in the near future. Although the use of regular meetings to upgrade technical knowledge is likely to be effective and relatively inexpensive, it does require supervision by SMS in the field, and in view of the shortage of bona fide SMS adequate supervision is not always possible at present.

Conclusion

In considering the economic returns to public investments in extension, it is difficult to attribute increases in production or incomes to extension as such, especially when investments are accompanied, as they so often are, by complementary changes—in pricing policy, for example, or in the availability of inputs. It is even more difficult to attribute any precise economic value to the different components of extension reform, such as regular farm visits, the narrowing of duties, or the inception of organized training sessions. It is therefore difficult to know at which point extension reform is at its most cost-efficient. Evidence of improved agricultural output following investment in extension does exist, however (see Ethiopia, Ministry of Agriculture 1984b; Kenya, Ministry of Agriculture and Land Development 1984; Chapman 1987), and only the severest skeptic would claim that such increases in production have been entirely unrelated to improvements in the

deployment and management of field staff. Much more useful than attempting a precise indication of extension's benefits is to focus on the complementary measures that are necessary to sustain any improvements in the extension services. As argued above, the most important challenges confronting governments and funding agencies in this regard concern the closer collaboration of research and extension, the improvement of support services to extension—and thus to farmers—and the establishment of mechanisms to ensure that extension is adequately financed.

14

New Developments in Agricultural Extension

Michael Baxter

The World Bank has been working with its member governments on agricultural extension since the late 1960s. It began by helping to finance relatively small extension components in agricultural projects (particularly for specific commodities such as cocoa or rubber) and in irrigation projects. From the mid-1970s, larger extension components were included in projects for agricultural development, integrated rural development, and agricultural research, which led eventually to projects devoted solely to extension. As table 14-1 indicates, in 1985 the World Bank was financing some 102 agricultural extension projects or projects with extension components in fifty countries. From 1975 to 1985 the Bank's financial commitment to agricultural extension amounted to about $2.4 billion.

The nature of the World Bank's involvement in agricultural activities has undergone and continues to undergo change to take account of developments in the agricultural, human, economic, and financial conditions of individual countries. The experiences of the extension services themselves, as well as of the Bank, have similarly been influential. Although originally the Bank may not have taken sufficient account of the different situations faced by extension services, its involvement in extension has subsequently been subject to considerable adjustment and experimentation. The best-known extension experiment supported by the Bank is the training and visit (T&V) system of extension. This, however, is not the Bank's "official" extension system, nor is it the only system financed by the Bank. Moreover, it is increasingly difficult to define the T&V system, since intentional and unintentional modifications to it occur during implementation. The Bank currently funds a variety of extension approaches, the main criterion being that the system should support farmers' technological needs effectively and economically.

In view of this wide-scale involvement in extension in a great variety of agricultural and administrative environments, it is difficult to speak of new developments in a universal sense. What may be new for Burkina Faso (where an effort is being made to link extension closely with agricultural research) may not be so in Indonesia (where highly structured extension-research linkages are now common). Similarly, an innovation in many areas is to have extension agents work directly with groups of farmers rather than with individuals, but this is certainly not new in francophone West Africa. Nevertheless, I have identified five significant innovations with potentially broad application that are under way in Bank-funded projects.

Before discussing the five developments, it is worth defining what the phrase "agricultural extension" means in the World Bank and in projects the Bank finances. It refers to a system that provides farmers with the technical advice required to increase their agricultural production and incomes (including advice on credit, other inputs, and markets) and provides agricultural service organizations (such as those for research and credit) with information on farmers' conditions, constraints, and priorities so that these organizations can serve the farmer better. The extension activities the World Bank supports more often than not relate to crops; separate organizations are normally responsible for livestock (especially veterinary matters), fisheries, and farm forestry, although these activities tend more and more to be integrated with extension services for crops. In some places, especially in Latin America, the Bank also supports social extension activities, whereby

Table 14-1. *World Bank–Financed Agricultural Extension Projects, 1985*

Region	Projects			Countries with projects
	Extension and extension/research	*With extension components*	*Total*	
West Africa	0	31	31	14
East Africa	3	17	20	12
Europe, Middle East, and North Africa	1	8	9	7
South Asia	16	1	17	5
East Asia and Pacific	6	4	10	8
Latin America	3	12	15	4
Total	29	73	102	50

Note: The table includes only projects that were being executed as of September 30, 1985.

field extension staff deal with nutrition, basic health, handicrafts, and domestic skills. These social extension services, as in Brazil, may be integrated with agricultural extension activities, but they are essentially separate. The Bank also finances other kinds of rural development—health and family planning, agricultural and vocational education, credit, industry, and services—all of which have significant links to agricultural extension and in some cultures and contexts are referred to as "extension." But as used in the Bank and in this chapter, the term "agricultural extension" relates specifically to agricultural technology.

Communications Systems and Technology

Three recent developments in communications systems and technology are particularly significant for extension: the proliferation of the electronic mass media (radio and television), the availability of small, handy video cameras, and the development of interactive video-computer systems. Each is reviewed in turn.

Provided radio and television programs are closely attuned to farmers' needs and conditions and are timed to complement agricultural operations, they can be a strong adjunct to field extension services—but not a substitute for them, as experience even in the developed countries indicates. Given the continuing expansion of market-oriented agriculture and the increasing complexity of input requirements, there is a need for the ongoing education of farmers and extension staff, and radio and television would be a good way to disseminate information to them. The difficulty of achieving topical relevance is perhaps the main constraint to the effective use of radio and television for this purpose in developing countries.

Small video cameras can have a significant impact on the quality of training for field staff and thus on the support that extension agents give to farmers and, more generally, on governments' responsiveness to farmers. Small enough to be highly mobile and relatively unobtrusive, simple enough to be used with limited training, and able to produce tapes that can be played back on increasingly common VCRs, these cameras can dramatically narrow the gap between farmer and government, and between field staff, teacher, and researcher. They have been successfully used in Latin America (for example, in Mexico's Programa de Desarrollo Rural Integrado del Trópico Húmido, PRODERITH) to elicit villagers' own analyses of their development situations, needs, and priorities. A more direct use of them by technical specialists, trainers, and even extension agents is for recording crop and other conditions to instruct both staff and farmers themselves. The advantages of these cameras—their flexibility and the field orientation they encourage—outweigh their cost when used appropriately.

Advances in microcomputer technology in the past decade have already had a significant impact on extension and on farmers' access to information and their understanding and use of this knowledge. The development of interactive systems will undoubtedly further influence the quality of extension work. There are already advocates who promote farmers' access to such equipment. For extension services in most developing countries, however, the most practical use of such equipment is in the training of extension staff. The quality of the technical staff, and consequently of the field staff, is often a major constraint on the upgrading of an extension service: interactive video-computer systems will no doubt help to overcome this constraint. In India, for example, interactive video discs on pump maintenance and irrigation water management are being used by the Ministry of Water Resources in conjunction with various training institutes. With the use of such systems teaching materials are uniform, train-

ees can proceed at their own pace, and their progress can be constantly evaluated. But to reap these benefits, training modules must be accurate, locally relevant, and available in sufficient number.

A critical problem facing extension staff in many developing countries is that technical recommendations are often not sufficiently specific to agroecological conditions and to the resources available in the locality. This problem is caused not by the absence of technology but by the failure of researchers to take account of the conditions facing each main type of farmer. Consequently, another important use of interactive systems is to encourage feedback from extension workers to researchers and other agricultural services and to help develop technologies of relevance to farmers. It should not be difficult to develop procedures whereby both researchers and extension staff can screen technical recommendations for their suitability. At the least, and as a starting point, interactive programs can be used to check the seasonal and economic ramifications of recommended practices—whether the period of cultivation takes account of preceding and subsequent crops and labor availability, for example, or the point beyond which prevailing prices do not justify the use of particular imports.

Privatization and Cost Recovery

The "buzz words" of extension planning, currently in vogue in many quarters, including the World Bank, are privatization and cost recovery. Indeed, given the budgetary situation of many governments and the obvious real gains in productivity of at least some farmers in most countries, privatization and cost recovery do have an attraction—and not only in developing countries. It is certainly true that the costs of an effective extension service can be significant, that public bureaucracies have built-in tendencies toward inefficiency, and that some extension services are already privatized. For these reasons privatization and cost recovery are fields in which further investigation does appear warranted.

The greatest advances are being made in privatization. Private extension services are common in some developing countries. The presence of high-value crops frequently encourages the emergence of individuals or small firms of private consultants who advise farmers on production and marketing. Similarly, useful extension activities as well as research are often performed by input supply companies, although their proprietary interests are usually paramount. Cooperative societies built around vertically integrated industries often have their own extension staff who give advice and perform a range of supply and marketing functions, as in the CFDT-inspired cotton companies and the BAT tobacco enterprises in Africa (see chapters 2 and 3). These extension staff do provide valuable services for the crops for which they are responsible; unless considerable care is taken, however, they may not be adequately coordinated with government extension services operating in the same area; nor do they always apply their resources to the food crops that are also grown by the farmers who produce the cash crop in question. There are now numerous instances, fortunately, where such shortcomings have been avoided (see chapter 2).

The World Bank is involved in a project in Chile in which agricultural credit funds can be used to pay for extension advice from private individuals. Other projects, for example in Nigeria, have provided staff to give large-scale farmers individualized advice on farm planning and management. (These advisory services have generally been on the public account, but the concept is only one step from privatization.) Extension services provided by the private sector, or even by profit-oriented parastatals, cannot but upgrade the quality of the support available to farmers, not only for the crops and activities in their domain, but also for the agricultural sector in general because of the competition they provide to government services.

Similarly, there are arguments in support of the principle of cost recovery. At least it instills a sense of financial discipline, and it is one criterion (of many) with which to evaluate the appropriateness of alternative extension strategies and activities.

There are limits, however, to the priority that should be given to privatization and cost recovery in developing effective, farmer-responsive extension systems. Knowledge, the "good" with which extension is concerned, is a public commodity. Only knowledge that is discrete and situation-specific is suitable for private transfer, which largely explains why private advisory services have developed for certain high-value crops, often those with high entry costs, rather than for subsistence food crops. Governments, however, are responsible for providing extension support to *all* farmers, many of whom in developing countries work with very limited capital and land in difficult environments.

A system in which private groups bid for the right to provide extension services in particular localities may be a way to reduce governments' direct involvement in extension. In such a system, however, it would be necessary to ensure that the extension service gives adequate coverage to the poorest and most isolated farmers and that it provides adequate feedback to, and pressure on, research and other agricultural services. In sum, experiments with privatization should continue, but under a watchful eye to make sure that ex-

tension support is well balanced among the various topics and locations.

Although the desirability of cost recovery is much discussed, and has been implemented to some extent in the context of commodity programs, cost recovery on food crop extension has seldom, if ever, been successfully implemented in developing countries. One can argue that the urban-biased terms of trade in most developing countries more than offset the direct costs of government-financed extension services and that charging farmers for extension on top of this "tax" on their output would be economically inequitable and also inefficient. In many situations—the most obvious being water for irrigation and urban utilities—charges are more easily quantified and payments more easily collected than in the case of extension services—but cost recovery is still not enforced. The logic of insisting on cost recovery for extension is therefore not always apparent. Given the generalized nature of extension's "good" (knowledge), costs are probably recovered most efficiently through indirect methods associated with the market economy, such as market fees. Of course, before cost recovery is enforced, one should be certain that the extension system actually operates effectively and provides knowledge of tangible value.

Group and Individual Approaches

Some extension services have spent considerable energy in evaluating the relative advantages of individual and group approaches to farmers. Often this debate has been conducted at the expense of actual work with farmers. Contributing to the debate is the fact that the T&V system was initially applied in areas where the need for group contact was not as apparent as elsewhere. To some extent, the discussion of the individual as opposed to the group approach has become a proxy for the debate over the relative merits of T&V and other extension systems.

In any discussion of individual and group approaches the goal of extension must be kept in mind. Whatever extension method is used, this goal is to reach farmers who represent a wide range of local production and resource conditions, and to reach them effectively, systematically, and in a way that can be monitored. In some locations—for example, villages highly stratified on caste lines—a group approach is not demonstrably more effective than a fundamentally individual approach. In others, especially African societies where group cooperation is a significant cultural motivator, a group approach is often more appropriate. In any location, however, the extension agent must invariably use a mixture of group and individual approaches: meetings with groups of farmers for general contact, work planning, and feedback, and visits to the fields of individual farmers (often in the company of other farmers) to examine specific conditions and to gather material for discussion with other farmers and for feedback to extension management, trainers, and agricultural services in general. Any local institution that can improve extension's access to and impact on individual farmers and the farming community in general should be utilized, whether traditional leaders or village groups on the one hand or local government authorities and cooperatives on the other.

Village or farmers' groups can often help to identify local production constraints and development priorities and to monitor the work of government agencies such as the extension service. Those who advocate the use of these groups, however, often do so on the basis of two particular assumptions. One is that effective farmers' groups do away with the need for extension agents. The other is that individual farmer contacts (such as the "contact farmers" under the T&V system) are inherently unrepresentative of the village at large (see chapter 7).

Both assumptions are erroneous. With effective farmers' groups, extension workers will normally be oriented more toward specific problems and local conditions; indeed they will often be more active (and certainly better monitored) than in the absence of such a group (see Morize 1985). The role of the extension agent may change as village "animators" undertake some of his basic functions, help farmers to use the extension service better, and apply pressure on the agent to serve the farmers more effectively; but the need for an extension agent is not diminished. Similarly, in countless instances contact farmers—also known as "lead," "pilot," or "progressive" farmers—are unrepresentative of their farming community and may even be a barrier to broader contact between extension workers and farmers; but there is also sufficient evidence that this need not occur.[1] The role of farmers' groups and individual contacts in extension requires a more pragmatic approach than is often taken, and it is hoped that this will receive increased attention.

Extension-Research Linkages

The great number of recent publications and international symposiums on linkages between research and extension attest to the need to strengthen the role of extension in identifying agricultural problems and orienting research toward finding solutions to those problems. There is also a renewed awareness that farmers, extension staff, and agricultural researchers operate

within one overall system and that effective communication is needed among them. An important advance in this field has been the development of farming systems research and allied approaches.

A major difficulty facing many extension services is that the technology made available to them by agricultural researchers is often not attractive to the farmers. Since the introduction of multidisciplinary diagnostic surveys by farming systems research, the extension and research organizations in a number of countries have undertaken comprehensive field reviews of farmers' production conditions and needs and the suitability of recommended technology. As a result, they have been able to identify gaps in their extension and research work. Interesting work is being done in this regard in Nigeria and a number of Eastern and Southern African countries, and some useful action-oriented reviews have also taken place in India.[2]

The use of diagnostic surveys by extension and research to assess farmers' actual production conditions and needs may appear to be an obvious step, given the not inconsiderable funds devoted to extension and research. It is surprising, however, how often agricultural research and extension organizations are *not* in effective, professional communication with each other, even though they are responsible for the same zone. In such circumstances, extension attempts to propagate recommendations long since heard and rejected by farmers, while research works toward optimal yields far beyond the interest and resources of farmers, even if they were to learn of the required technology. A development such as farming systems research, which brings farmers' conditions and needs to the notice of extenion and research, can only be encouraged in these conditions.

A related trend is for crop-based extension services to handle farmers' other productive activities. Once the methodological expertise of extension field staff is established and training and research programs appropriately oriented, an extension service should pay attention to farmers' noncrop interests. The integration of extension services for both livestock production (not veterinary services) and crop production is of basic importance in many farming societies where crops and livestock are interrelated. In Ghana and southern Nigeria the strengthened agricultural extension service initially focused on crops, but the work programs of extension staff now include tree crops, livestock, and farm fisheries. Extension is also involved in farm forestry in areas where there are active programs, as in some Indian states and African countries (Ethiopia, for example, on a pilot basis). As staff resources permit—and here quality is a more important consideration than staff numbers—an extension service should become involved in all productive farm activities of significance.

Extension and Women as Farmers

The involvement of women in farming operations varies significantly between cultures. It is not uncommon, however, for women to perform a greater share of agricultural tasks than men. But technological developments (especially varietal improvements and improved implements) often benefit the tasks and the crops to which men's attention is directed, rather than those associated with women.

There is now increased pressure on extension and research services to focus more effectively on the tasks performed by women. Practical solutions are difficult to identify, however, and even more difficult to implement. For example, the common proposal to have more female extension staff is not necessarily an answer if female employees are constrained from traveling freely and from meeting farmers or if suitable technology for the tasks performed by women farmers is not available. At the same time, undue emphasis on home economics by women extension staff only diverts attention from the more critical issue of women's role in agricultural production.

In view of the orientation of most extension and research services, the composition of their staffs, and their poor track record in helping women, the task of developing effective extension for women farmers will not be easy. Attention should continue to be given to the role of women in agriculture, but priority should be given to small projects in which women-oriented extension methods are used not only to disseminate information but also to gather it, so that extension services can learn more about the specific problems women face and increase staff awareness of the general issues. Of the new developments discussed here, the successful implementation of effective agricultural extension activities for women farmers is likely to be the most difficult to achieve, but also perhaps the most significant in the long term.

Conclusion

The developments reviewed here are in many ways not new; they are established issues in extension that require continuing attention. Fortunately, they will benefit from what is possibly the most significant of the new developments—the greater attention now being given to agricultural extension by governments, development organizations, and educational institutions.

Despite the obvious benefits of this attention, there is also some cause for concern. In the process of demonstrating the importance of extension and of justifying

its more central place in agricultural development, there is a tendency to overlook some basic principles of effectiveness. Analysis and design become increasingly complicated; extension systems and farmer-extension-research interaction become overelaborate. Extension, after all, takes place with farmers, most frequently in their fields; and it is only there that the impact and effectiveness of extension operations can be determined. This cardinal reality can easily become obscured in the excitement of working in an important and expanding area. In the design and operation of extension systems, however, the simplest and most direct method of ensuring frequent, systematic contact between farmer and extension worker, and between extension technical specialist and agricultural researcher, is, until proven otherwise, the best. Perhaps of greatest importance is a constant review of agricultural extension systems to ensure that staff, functions, and components actively contribute to efficient, field-based, farmer-responsive professional extension.

Notes

1. For contact farmer selection and function, see the papers emanating from the World Bank–Haryana Agricultural University research project on the impact of extension in Haryana (for example, Slade and Feder 1984).

2. The three-volume *Status Report of the Tamil Nadu Northwestern Zone* produced by the Paiyur Regional Research Station of the Tamil Nadu Agricultural University in India (April 1986) is one such review.

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THE WORLD BANK

The first collection of articles on the practical application of different methods of agricultural extension in Africa, this book is a lively contribution to the controversy over which form of extension is most appropriate for conditions in African agriculture. Although the World Bank has long supported the training and visit (T&V) system of extension, first developed by Daniel Benor in India, its application in Africa is questioned by some of the authors, who propose modifications or alternatives to T&V.

The extension systems in more than a dozen east and west African countries are described. They include commodity-based extension services (such as those provided by the large cotton and tobacco companies in Africa), the farmer-focused approach of the T&V system, community-based extension that relies on the participation of farmers through village associations and cooperatives, and the farming systems approach that takes account of the whole agricultural production enterprise and farm family.

Among the problems considered are cost-effectiveness, the weakness of African systems for generating technology, the difficulties of forging more productive partnerships between researchers, extensionists, and farmers, and the ineffectiveness of public services and the fragility of institutions and infrastructure in most of Sub-Saharan Africa. Other issues discussed are the limited participation of farmers in the management of extension and the tendency of government extension services to respond more to bureaucratic imperatives than to farmers' needs. The authors, who are largely extension practitioners, differ markedly in their solutions to these problems, but several call for blending the strengths of the various extension systems to serve the special needs of African agriculture.

Nigel Roberts is now the resident representative of the World Bank in Nepal and was formerly with the Eastern and Southern Africa Projects Department of the Bank, specializing in agricultural extension.

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